MODERN PLASTICS

MARCH 1953

A walk around your office may put your product-planning Miles Ahead

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LUSTROUS FINISH

ELECTRICAL SAFETY

LIGHT WEIGHT

IMPACT RESISTANCE

● Just stroll around your desk and you'll see examples of the versatility that makes the phenolics stand out among all plastics . . . and simplifies product planning for so many manufacturers. Whatever your products may be, there's a likely place where these materials can enhance their appearance, durability, ease of use, efficiency, and economy of production.

In the form of molding materials or resins, Durez phenolics provide unusual resistance to heat, impact, abrasion, water, electrical current, and many chemicals. They offer remarkable flexibility of design. Their use often reduces assembly operations and handling and shipping costs.

The phenolics have been the special sphere of Durez operations for 32 years. We are constantly adding new compounds and industrial resins that provide new ways to make things that sell and serve better. Your custom molder and our technical staff will gladly work with your research people in suggesting . . . and working out . . . their profitable application in your business.

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- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Write, on office letterhead.

DUREZ PLASTICS & CHEMICALS, INC.
1203 Walck Road, North Tonawanda, N. Y.

Member S. P. I. Committee on Large Plastics Moldings

Keeping up on PHENOLIC RESINS

Disposal problem turned into valuable raw materials for

CABINET PANELS

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TOYS

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In addition to Styrene Molding Compounds, Catalin chemical products include a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

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*Patent applied for

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and
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The molding is a two-operation job . . . frame from one mold . . . louvres from a combination mold. The louvres at the left are individually adjustable so air may be directed up or down or in more than one direction.

◆ ◆ ◆ ◆

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Circulation Department
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Executive and Editorial Offices
575 Madison Ave., New York 22, N. Y.
Tel., PLaza 9-2710

Branch Offices
Chicago 11: 101 E. Ontario St.
J. M. Connors Tel., Delaware 7-0060
Cleveland 14: 815 Superior Ave.
R. C. Beggs Tel., SUperior 1-0737
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EDITORIAL

The Broadened Bases

One interesting thing about the plastics industry is that no sooner has someone said "Why don't they make a plastics such-and-such?" and someone else has said, inevitably, "A such-and-such should not be made of plastics," than a plastics such-and-such is placed on the market!

Another interesting thing is that the new plastics such-and-such is generally a vast improvement functionally and economically over its predecessor. Only by creating better products which offer better values can the plastics industry maintain and increase its business.

Our January editorial called the attention of the industry to the fact that last year witnessed expansion of plastics use in already opened fields of application, but that 1953 would likely be a year in which the bases of plastics application would have to be broadened—a year in which new fields must be opened up. In that editorial some suggestions were made concerning fields in need of immediate attention.

No sooner had our January issue gone to press than the old phenomenon appeared. In the intervening weeks the bases of plastics application have been broadened considerably.

At the National Home Builders Exposition plastics bath tubs were displayed. At the Furniture Mart a completely molded dinette set (table and chairs) and a line of furniture using molded plastics drawers were exhibited. At the Housewares Show a plastics picket fence was offered. Meanwhile, we have reported on a plastics filing drawer and a complete line of plastics luggage, and we will soon report on a plastics gutter and downspout, a plastics duplicating machine, and a plastics truck body.

New examples of the broadening of the bases of the plastics application are coming up every day. A check among industrial designers indicates that they are busier with new projects in plastics than ever before. A check on mold and die engineers shows that they are swamped with work on new things to be made out of plastics. These new design and mold engineering jobs are not revisions of established plastics items nor are they "Chinese copies." They are new products for markets new to plastics.

A further indicator of the trend is the recent marked increase in inquiries coming to MODERN PLASTICS concerning selection of materials for new applications and services for producing components. Apparently not only are the people in the plastics industry doing aggressive imagineering; people who have never considered plastics are now planning to use them.

That this is happening in a time of free supply of all materials is most encouraging, for it means that plastics are being more widely considered as prime materials for new products.

We sincerely believe that the present year will be recorded in history as a period in which the bases of plastics applications were broadened. And we believe that the results of this development will make the 1954 National Plastics Exposition a most thrilling event.

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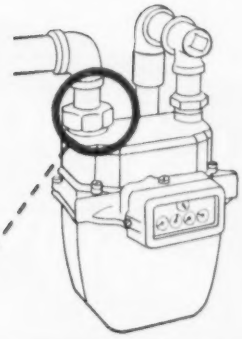
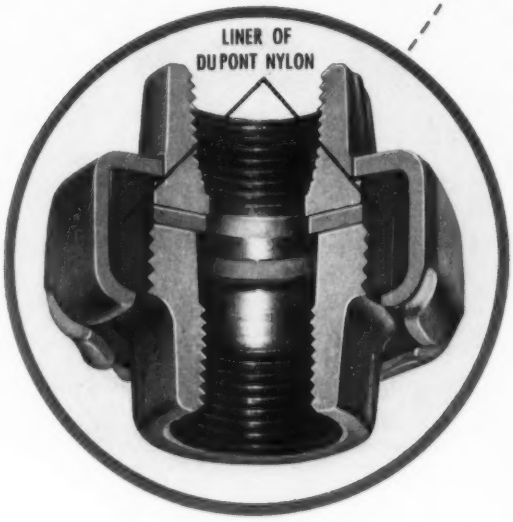


Du Pont Nylon plastic protects against corrosion



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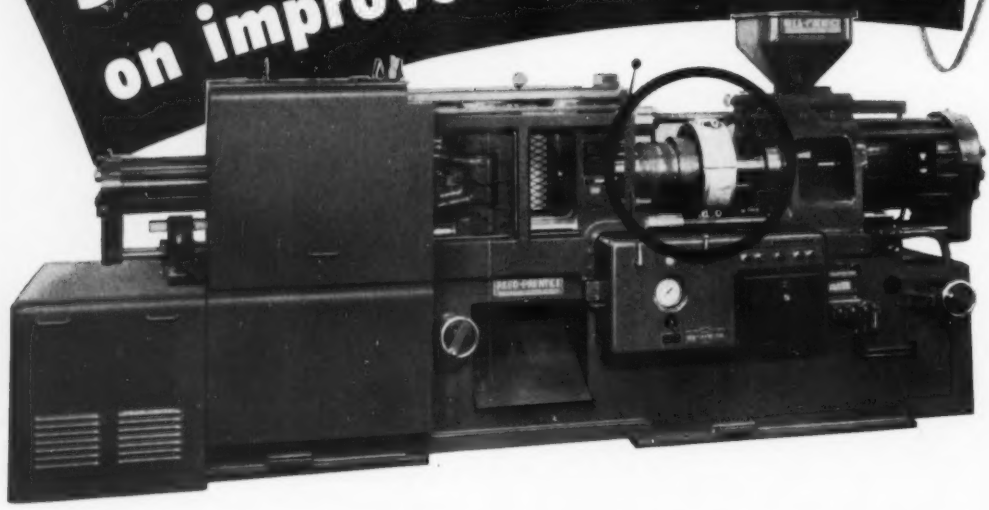

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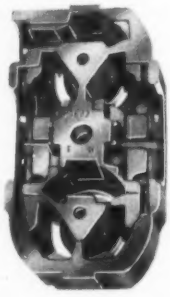

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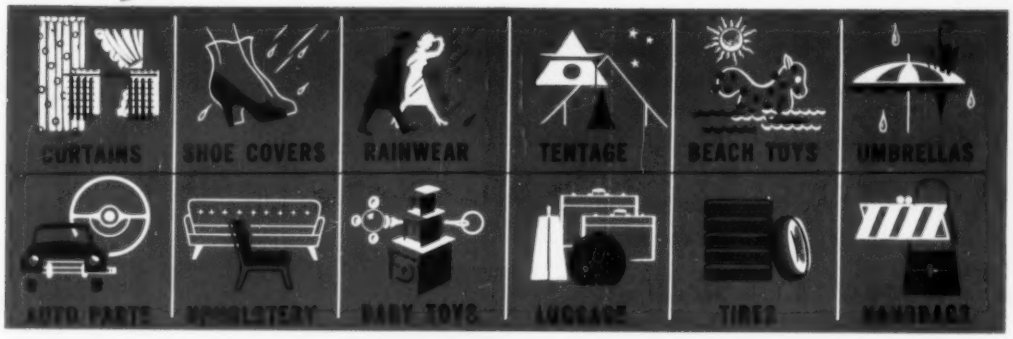

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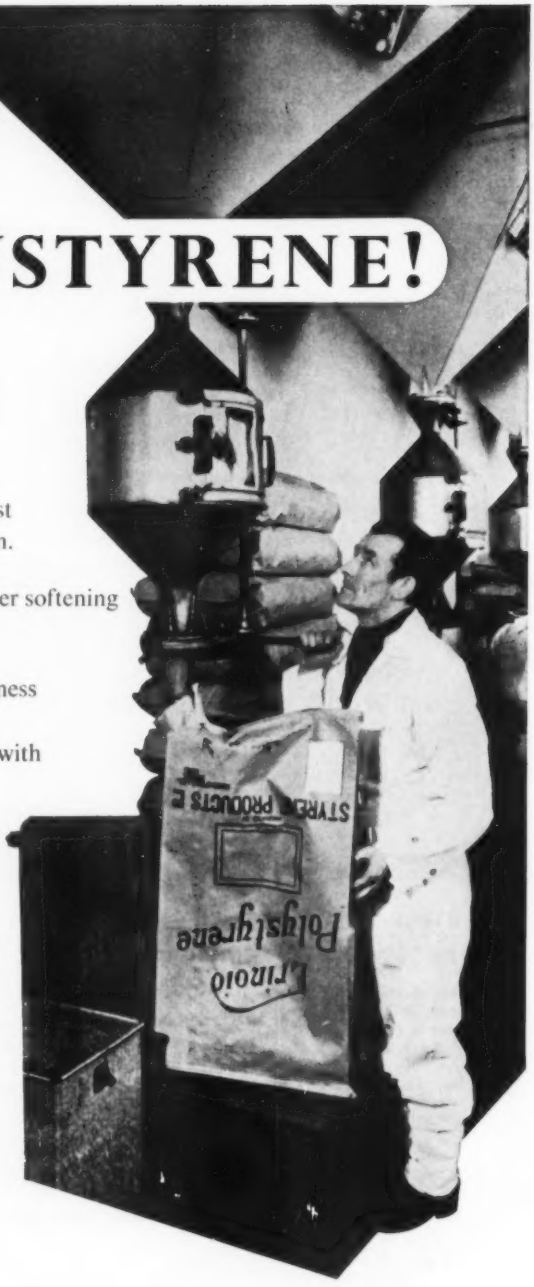

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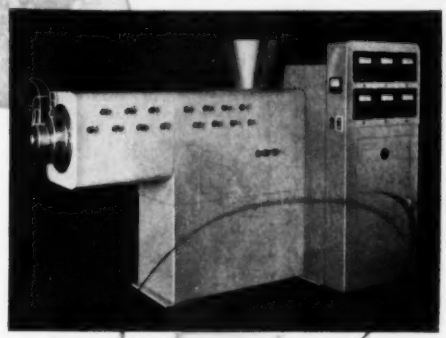

mpm

the most popular extruder for material suppliers' development laboratories

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**names on request*

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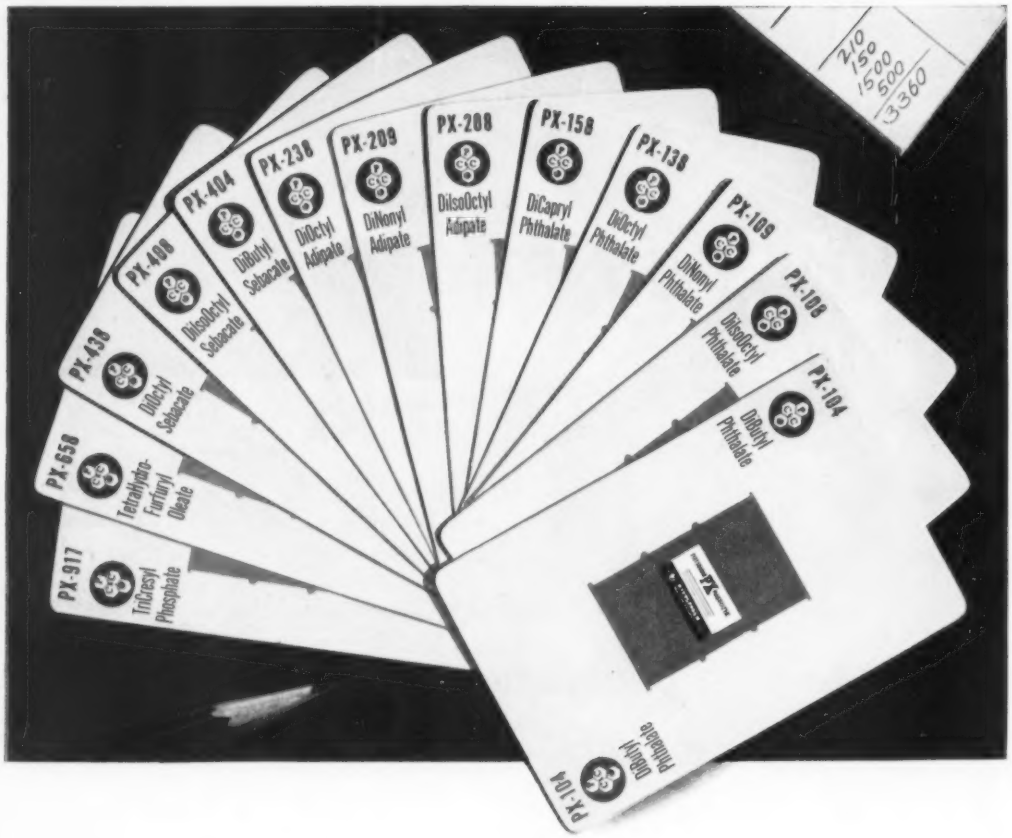

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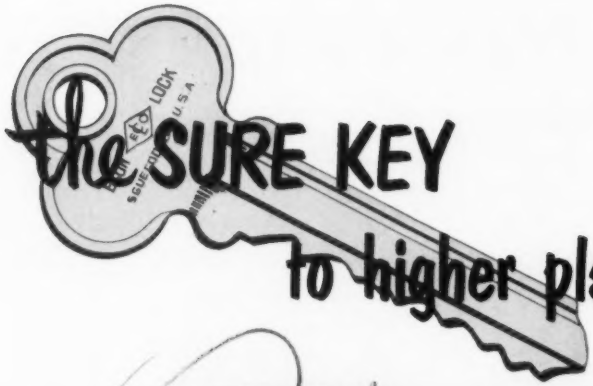
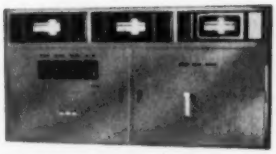
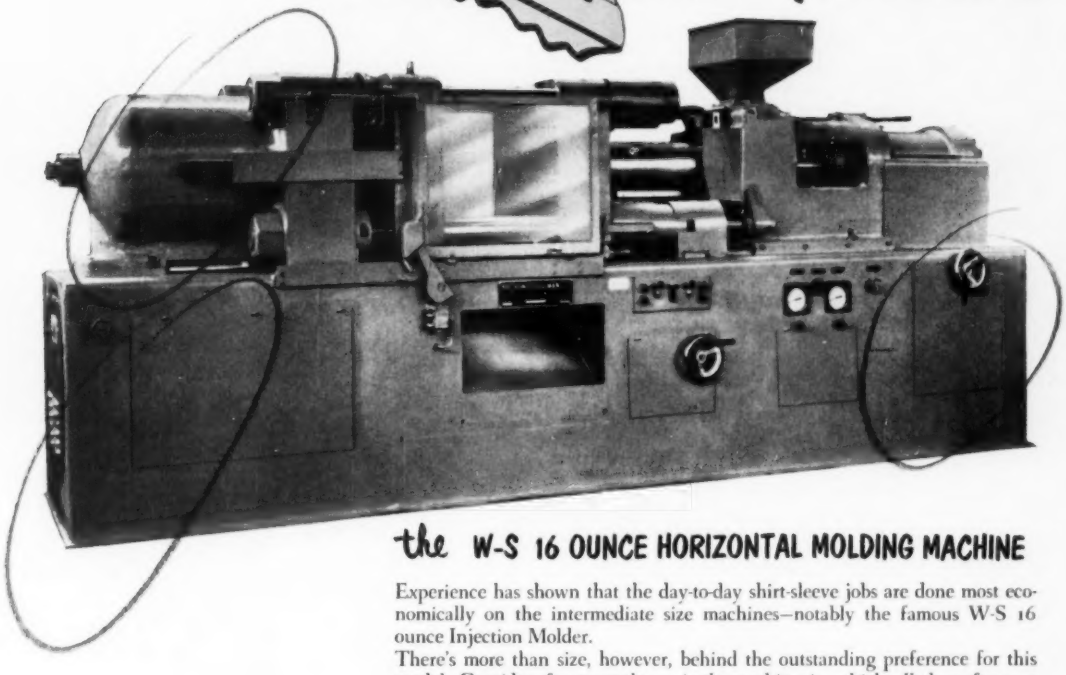
COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON



to higher plastics production

Three-zone temperature control





the W-S 16 OUNCE HORIZONTAL MOLDING MACHINE

Experience has shown that the day-to-day shirt-sleeve jobs are done most economically on the intermediate size machines—notably the famous W-S 16 ounce Injection Molder.

There's more than size, however, behind the outstanding preference for this model. Consider, for example, a single machine in which *all* these features are offered:

- Extra long heating cylinder for increased plasticizing efficiency . . . COMPARE!
- Three-zone temperature control . . . COMPARE!
- Replaceable bronze bushings in cylinder and moving platens...COMPARE!
- Faster cycles with dual pressure controls . . . COMPARE!
- Hydraulic and electric safety controls . . . COMPARE!
- Special pumping unit . . . COMPARE!
- Remote control panel . . . COMPARE!

If *your* profits are coming in something less than the full measure, it will pay you handsomely to investigate this profit-booster NOW. Detailed literature and/or personal analysis without obligation.

W-S HYDRAULIC

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

150 Aldene Rd., Roselle, New Jersey

Foreign Sales Representatives: OMNI PRODUCTS CORP, 460 Fourth Avenue, New York 16, N. Y.

Correspondents Throughout the World

New-Improved
LABORATORY "251" GRANULATOR

- *granulates directly into any 30" drum*
- *takes less floor space*
- *large 8"x8" throat opening*

One of the leading molders in the East dictated this new design. These new, improved features meet the requirements of every plant:

LESS FLOOR SPACE:—With work space at a premium, the LABORATORY "251" now takes an absolute minimum of floor space.

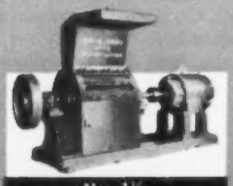
GRANULATES DIRECTLY INTO 30" DRUM:—Eliminates the necessity of transferring material from bin to drum. *This machine also provided with bin receptacle if desired.*

NEW HOPPER DESIGN:—Eliminates fly-back leakage.

These new advantages, plus sturdy construction make the LABORATORY "251" a superbly dependable machine. The 8" x 8" throat opening takes large sprues and runners, with a capacity of 100 to 150 pounds per hour. Standard screen furnished to meet your granule size requirement. The entire machine has been designed for easy accessibility to all parts. Hopper, screen, and chute are all removed quickly for cleaning. Delivered with or without casters.

There's a B & J machine for every need. Tell us your requirements and send samples of your material for grinding in our testing laboratory. Or write for brochure describing our many different size machines.

HEAVY DUTY IDEAL medium size machine for grinding tough, dense waste. Capacity up to 250 lbs. per hour. 5 H.P. motor.



No. 1½ for high production grinding. Capacity up to 1200 lbs. per hour. 20 or 25 H.P. motor.

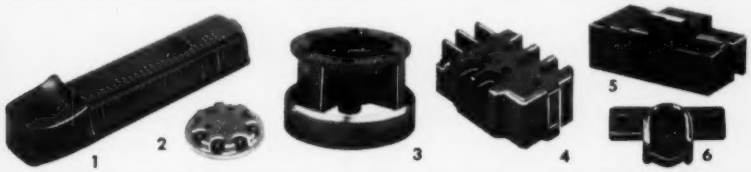
B & J BALL & JEWELL, INC.

Leaders in Granulating Machinery for Half a Century

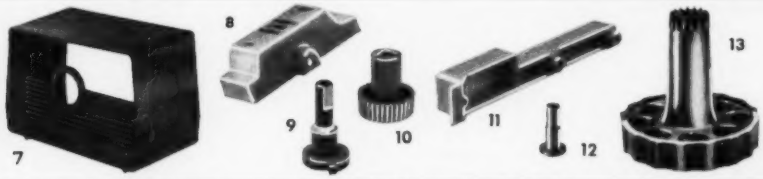
22 FRANKLIN STREET BROOKLYN 22, NEW YORK

What's YOUR Line?

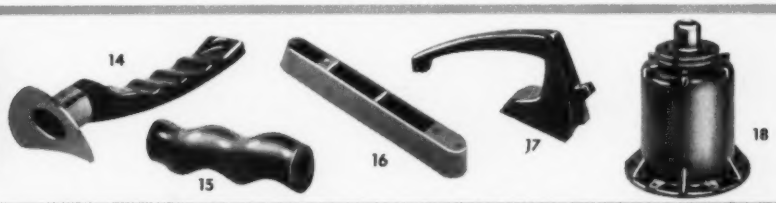
ELECTRIC ELECTRONIC ?



RADIO TELEVISION MUSIC ?



APPLIANCES HOUSEWARES ?



SOMETHING ELSE ?

These applications demonstrate *our* line—custom moulding of thermosetting plastics. Complete moulding facilities, including design and mould-making!

Note, please, that some of these parts are quite intricate. Note, too, that while the majority of these pieces are moulded of standard thermosetting materials, quite a few are made of newer materials with which we've acquired a working knowledge almost unique in the industry. Pieces numbered 19, 20, 23, and 24 are moulded of Teflon—those numbered 2, 21 and 22, of glass-reinforced plastics—numbers 6 and 12, of Alkyd.

Based on experience like this, don't you think *your* line could benefit from service by *our* line? Phone or write our Dayton office—or your local branch office—for full information.

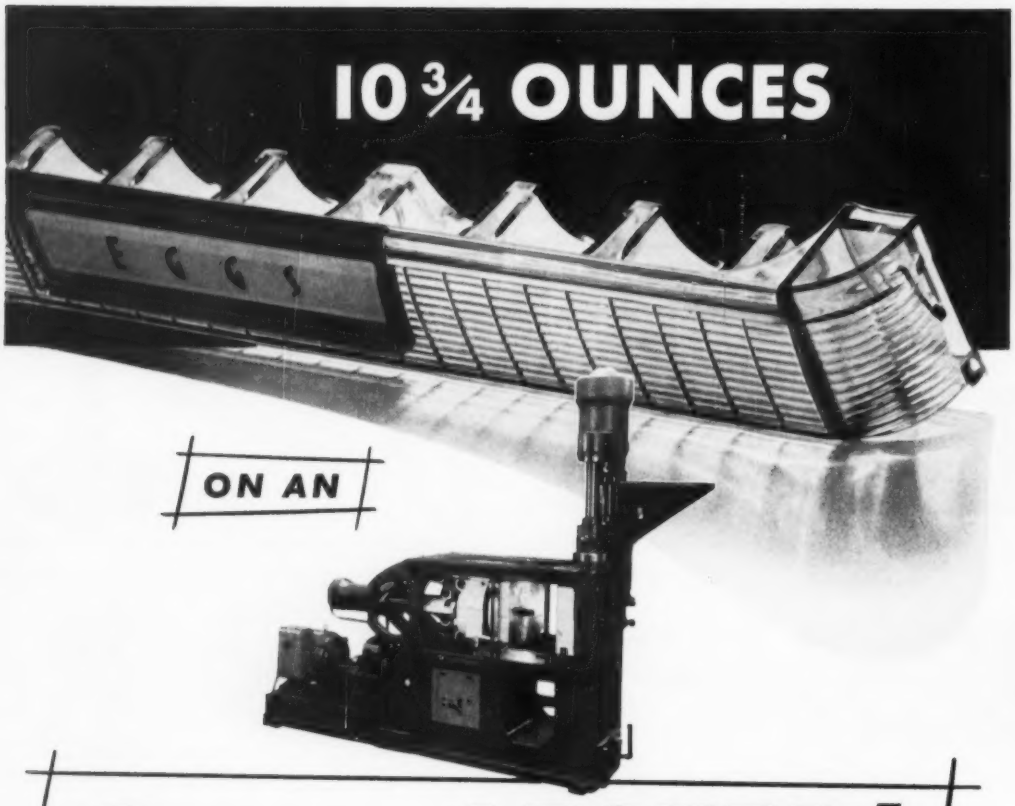
Kurz-Kasch, Inc. • 1415 S. Broadway • Dayton 1, Ohio

BRANCH SALES OFFICES: New York, Lexington 2-6677 • Rochester, Hillside 4352 • Chicago, Merrimac 7-1830 • Detroit, Trinity 3-7050 • Philadelphia, Hilltop 6-6472 • Dallas, Logan 6-5234 • Los Angeles, Richmond 7-5384 • St. Louis, Delmar 9577 • Toronto, Riverdale 3511
EXPORT OFFICE: 89 Broad St., New York City, Bowling Green 9-7751.

Kurz-Kasch

FOR OVER 38 YEARS PLANNERS AND MOULDERS IN PLASTICS

10 3/4 OUNCES



ON AN

8 OUNCE LESTER!

AT SINKO MFG. AND TOOL CO. in Chicago, if you ask Howard Nielsen, Treasurer and General Manager, about the new L-2-8 ounce Lester, he'll tell you, "what a lifesaver." When they had to run the polystyrene egg-tray compartments shown here for the Admiral refrigerator, the 32 ounce press where it usually runs was loaded. Even though the part weighed 10-3/4 ounces in polystyrene, they decided to try the mold in their new Lester to see what would happen. They saw! It started running and they were in production—and at a cycle competitive to the 32! What a wonderful feeling for a molder to know that his machines have that extra capacity in a tight spot.

The 8 ounce Lester is rated in polystyrene and has 350 tons of locking pressure. It will take an 1823 DME mold base. Write for complete specifications on the machine whose capacity is suited to your needs. And ask for a free copy of the Lester-Phoenix house organ, "The Lester Press".

LESTER INJECTION MOLDING MACHINES

REPRESENTATIVES

New York . . . Steven F. Krould
Detroit . . . . Thoresen-McCosh
Chicago . . . . . J. J. Schmidt
Cleveland . . . . Don Williams
Cincinnati . . . Index Machinery Corp.
Los Angeles . . Seaboard Machinery Co.
San Francisco . . . . J. Fraser Rae
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Toronto, Canada . . Modern Tool Works, Ltd.
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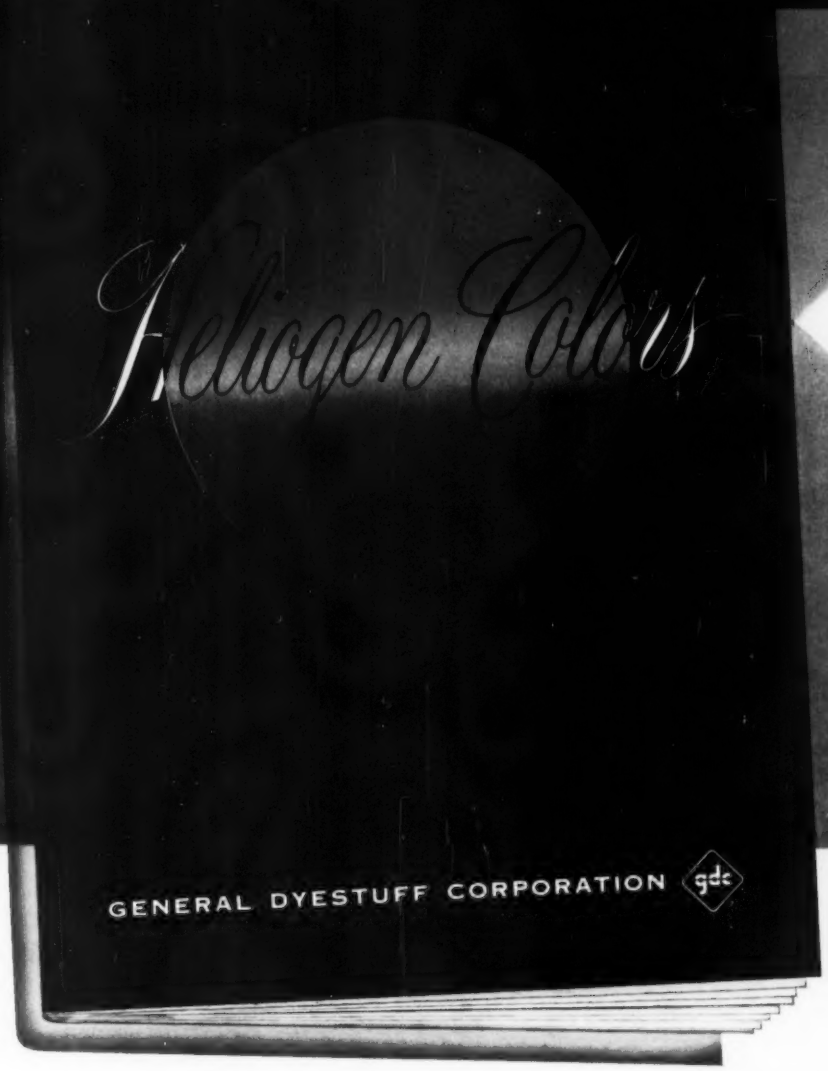
distributed by LESTER-PHOENIX, INC., 2621-H CHURCH AVENUE • CLEVELAND 13, OHIO



for outstanding permanence in blues and greens

When permanence is a primary requirement in blues or greens, the answer for years has been

HELIOGEN colors, pioneer phthalocyanine compounds.

Outstanding for:

- ENAMELS
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- LAKES
- PAINTS AND LACQUERS
- PAPER
- PLASTICS
- PRINTING INKS
- ROOFING GRANULES
- RUBBER
- SOAP
- TEXTILE PRINTING

For more complete information send for the HELIOGEN brochure describing the products as to shade, physical state and working properties.

gdc

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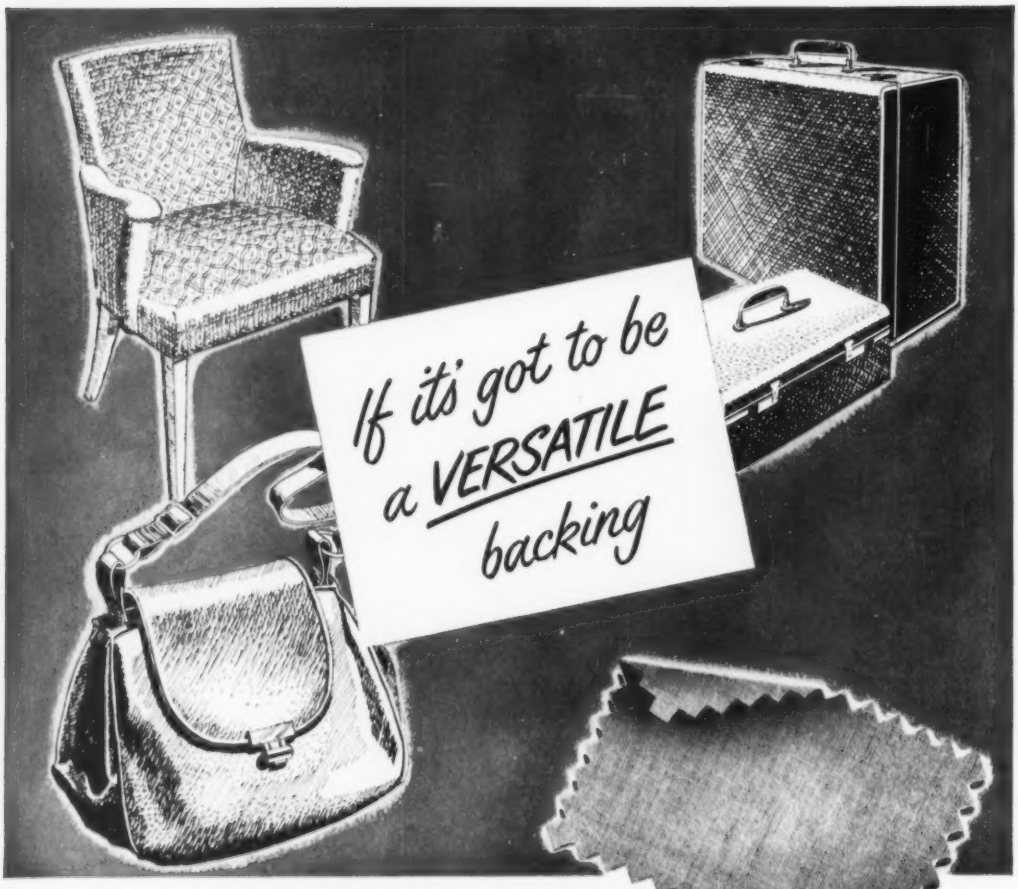


make it "COLUMBUS SHEETING"

another Wellington Sears fabric for coating

"Versatility plus" in a wide variety of coating applications is the story behind Wellington Sears' Columbus sheeting. Combine this with its consistently uniform quality—yard after yard—and you have the important reasons why this lighter weight fabric has such an outstanding reputation among industrial textiles.

Columbus sheetings are made 40 to 120 inches wide in weights from 2 to 5 ounces per square yard. Whether it's for furniture upholstery, luggage, handbags, bookbindings or any coating use demanding high quality, flexibility, easy handling and a minimum of production rejects, you'll find Columbus sheeting the all-around performer for your needs.

Other Wellington Sears fabrics for coating, as well as for plastic laminating, are listed at right. A call or letter to your nearest Wellington Sears office will bring you full information. Whatever your fabric problem—let's talk it over.

Superior Fabrics for Coating and Laminating

- Single filling ducks
- Army ducks
- Chafer ducks
- Special ducks
- Sateens
- Twills
- Broken twills
- Drills
- Sheetings
- Nylon, rayon and other synthetics
- Lantuck non-woven fabrics

Wellington Sears

A SUBSIDIARY OF WEST POINT MANUFACTURING COMPANY

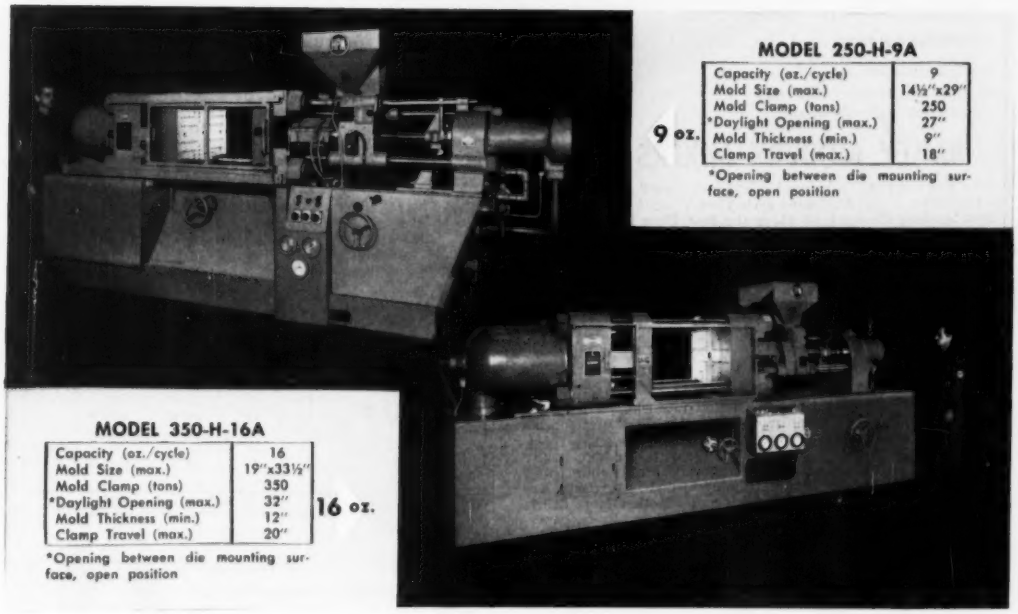
FIRST In Fabrics For Industry

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

OFFICES IN: ATLANTA • BOSTON • CHICAGO • DETROIT • LOS ANGELES • NEW ORLEANS • PHILADELPHIA • SAN FRANCISCO • ST. LOUIS

More parts out the door...

with H-P-M 9 and 16 oz. injection machines



MODEL 250-H-9A

9 oz.

Capacity (oz./cycle)	9
Mold Size (max.)	14½"x29"
Mold Clamp (tons)	250
*Daylight Opening (max.)	27"
Mold Thickness (min.)	9"
Clamp Travel (max.)	18"

*Opening between die mounting surface, open position

MODEL 350-H-16A

16 oz.

Capacity (oz./cycle)	16
Mold Size (max.)	19"x33½"
Mold Clamp (tons)	350
*Daylight Opening (max.)	32"
Mold Thickness (min.)	12"
Clamp Travel (max.)	20"

*Opening between die mounting surface, open position

The H-P-M 9 and 16 are designed to give you more quality parts regardless whether they are shallow or deep draw jobs. New advanced design features include—easy accessibility for mold mounting... improved feeding mechanism, plasticizing chamber, knock-outs and mold slow down... plus easy conversion to pre-plasticizing to meet your future requirements.

For time-saving convenience, H-P-M pumps, valves and piping are mounted on the outside . . . easy to get at. Both machines are fast . . . have plenty of mold space . . . full hydraulic clamp with ample clamping pressure . . . and a long stroke for those deep parts.

H-P-M builds the machine complete, including all hydraulic components assuring undivided responsibility to the user. Write today for full details!

HPM

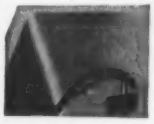
THE HYDRAULIC PRESS MFG. CO.

1010 Marion Road, Mount Gilead, Ohio, U. S. A.

Presses for Every Pressure Processing Application

REDUCE PRODUCTION COSTS WITH R. N. Bailey *MACHINES!*

SPECIFICALLY ADAPTED TO PLASTICS!



ROUNDED CORNERS

For quicker—more complete cleaning to prevent color and formulation contamination.

THE BAILEY MIXER ELIMINATES SOLIDIFYING ON HOT SURFACES

THE BAILEY MIXER

When load does not exceed recommended capacity there is no floating of materials on the top or in corners of the Bailey Mixer . . . no dead spots in the mixing operation.

Table below shows cylinder sizes and maximum recommended capacities for standard horizontal mixers. Mixing capacity is based on cylindrical volume of mixing element and is maximum for which machine should be used. Bailey Mixers are available to any desired specifications.

BAILEY MODERN MIXERS

Now you can pre-mix before loading into your Banbury, calender or extruder . . . shortening cycle time . . . increasing production and boosting efficiency all along the line. Here is up-to-the-minute construction with the very latest improvements in design. Center discharge with efficient combinations of ribbons and paddles on mixing element assures extremely thorough intimate mixes with minimum power. Element design facilitates cleaning of internal surfaces.

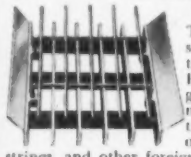
Standard cover sealed with felt or rubber packing. Labyrinth seal with tongue on top of body fitting into groove on cover assures dust-tight seal entire life of mixer.

Write now for complete details and learn why such companies as Monsanto, American Cyanamid, Borden, Ross & Roberts, Resiloid, Ideal Plastics, Armstrong Rubber and others . . . all use BAILEY MIXERS.

MIXER SIZES AND CAPACITIES

Mixer Size	Size Cylinder		Capacity Per Charge	
	Dia.	Length	Cu. Ft.	Gals.
1	12″	1′-6″	1.00	7.5
5	18″	4′-0″	7.00	52.0
8	24″	6′-0″	19.00	140.0
11	30″	8′-0″	40.00	295.0
13	36″	8′-0″	56.00	425.0
15	42″	10′-0″	96.00	725.0
16	48″	10′-0″	125.00	950.0
18	54″	12′-0″	192.00	1440.0
20	60″	12′-0″	234.00	1750.0

Intermediate sizes available



MAGNETIC GRATE SEPARATORS

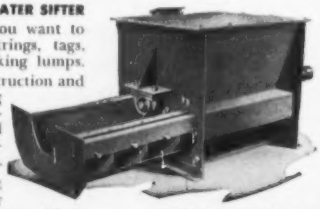
The Magnetic Grate consists of highly saturated Alnico No. 6 magnets and intervening steel bars.

Placed in the throat of the hopper, the grate attracts every ferrous object from material being loaded in machine. Retaining this and all other large debris of all kinds—rags, sticks, stones, paper, strings, and other foreign objects, it helps prevent damage to expensive machinery.

The grate can readily be lifted out for removal of tramp iron and debris.

Magnets are of permanent type. They are always in operation because no one can turn the magnetic force on or off. It is always constant.

The Magnetic Grates are available in sizes from 2″ x 4″ up to 8 feet square. Grates of virtually any size or shape can be furnished to meet unusual requirements.



BAILEY BRUSH OR BEATER SIFTER

Eliminates what you want to eliminate! Paper, strings, tags, refuse—also for breaking lumps.

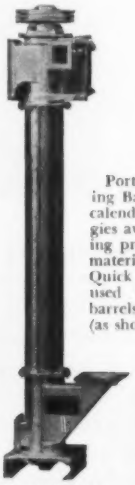
All-steel welded construction and dust tight. Sliding drawer sieve to remove brushes and sieves without disturbing spouting.

Supplied with direct gear, V belt, or roller chain with clutch drives. Made of choice of metals for your specific purpose.

SIZES

8″ x 24″, 12″ x 24″, 12″ x 30″, 16″ x 36″, 18″ x 36″, 18″ x 48″.

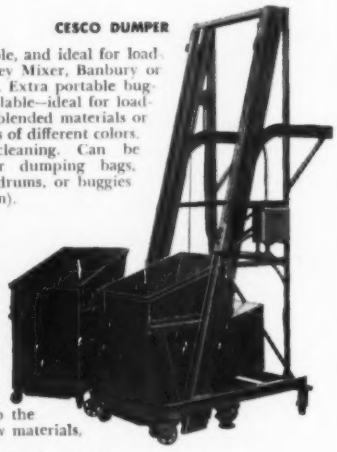
Larger if required.



BAILEY VERTICAL SCREW ELEVATORS

The vertical screw elevator illustrated is available in almost any height. The drive is a slow speed motor mounted vertically with V belts driving to the elevator shaft at top. Easily cleaned it handles raw materials, ground scrap, and many other materials.

We have a complete line of standard and special screw conveyors and bucket and screw elevators.



CESCO DUMPER

Portable, and ideal for loading Bailey Mixer, Banbury or calender. Extra portable buggies available—ideal for loading pre-blended materials or materials of different colors. Quick cleaning. Can be used for dumping bags, barrels, drums, or buggies (as shown).

R. N. BAILEY & CO., INC.

11 W. 42nd St.
New York 18, N. Y.

Our wide range of quality controlled phenolics embraces a combination of properties suitable to almost any application. To solve production problems... improve product performance... or add sales appeal...look to Plenco for the *right* plastic!

Phenolic thermosetting molding compounds are produced in general purpose grades and materials with special impact strength, heat resistance, or properties for deep drawing of large castings. Special purpose molding compounds in blacks, browns, mottles and other colors for particular molding requirements.

we supply the right combination

Phenolic synthetic resins are manufactured in dry, lump and finely ground particle sizes, or in solution adaptable to the application. Plenco engineers are available to help insure the success of a product through the stages from research to application.

PLENCO PHENOLICS

FOR BETTER PLASTIC PRODUCTS

For additional information on the forms, properties, and advantages of Plenco Phenolics, write to:

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

The Little Big Shot in Plastics!

Small but powerful . . . the **LEWIS "4"** is the lowest cost machine available today for production molding of lightweight large-area parts. Only the **LEWIS "4"** can mass produce 2 to 3-ounce parts in molds originally designed for 8-ounce machines. It's compact . . . simple to operate . . . economical to buy and use.

The **LEWIS "4"** features semi-automatic operation, multiple shot injection and full-mold high-pressure injection at low plunger pressures. Exclusive fast-opening crank-operated die-lock mechanism permits operator to release dies and clear jammed nozzles in 20 seconds or less without leaving the operating panel.

The **LEWIS "4"** handles almost any molding material and accommodates molds up to 12x23" mounted vertically and 13⅜x20" horizontally . . . yet it requires only 16 sq. ft. of floor space and operates so quietly you can use it anywhere.

Dollar for dollar, the LEWIS "4" gives you more!

Write today for illustrated Catalog No. 101 for additional details

1093-LW

LEWIS THE LEWIS WELDING & ENGINEERING CORPORATION

11 INTERSTATE STREET • BEDFORD, OHIO

Only one tapered roller bearing gives you all these 10 advantages...

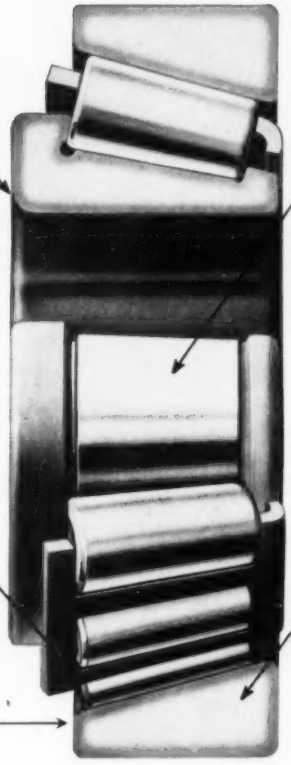
1 **GENEROUS RADIUS**—for greater shaft strength.

2 **CHOICE OF 26 DIFFERENT TYPES.**

3 **SOFT STEEL CAGE**—to keep rollers separate and prevent scuffing.

4 **PRECISION MANUFACTURE**—which makes possible bearings with a maximum runout tolerance of less than 75 millionths of an inch.

5 **CASE-HARDENED BEARING SURFACES**—to resist wear.



6 **MICRO-INCH SURFACE FINISH**—to minimize friction.

7 **CHOICE OF 5850 SIZES.**

8 **TIMKEN FINE ALLOY STEEL**—specially developed to give long bearing life.

9 **TOUGH CORE**—to resist shock.

10 **POSITIVE ROLLER ALIGNMENT**—gives maximum bearing capacity.

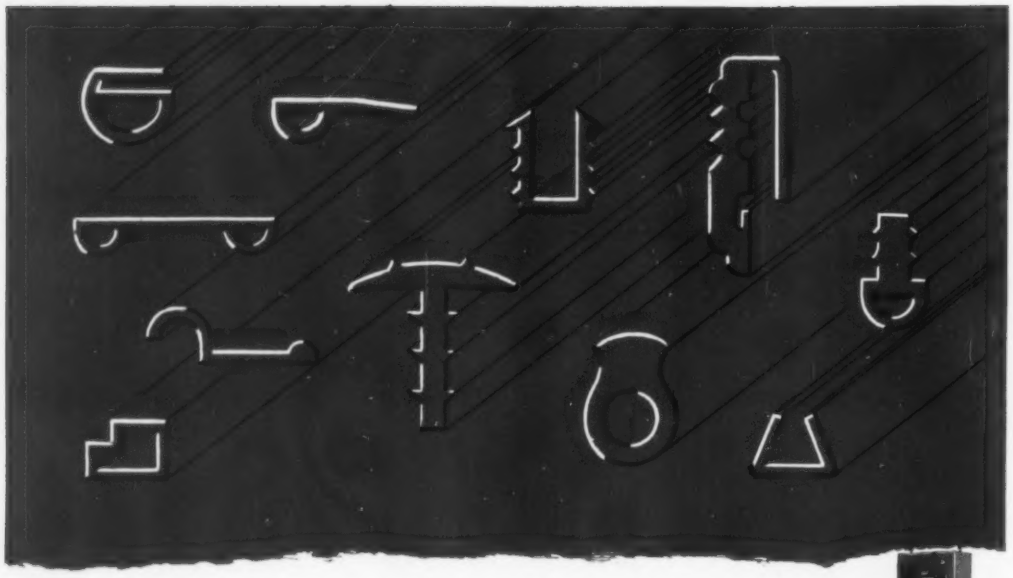
...it's stamped with the trade-mark "TIMKEN®"

NO other bearing gives you *all* the advantages you get with Timken® bearings. Ten of these advantages are listed above. They result from the fact that the Timken Company is the foremost producer of tapered roller bearings and leads in 1) advanced design, 2) precision manufacture, 3) rigid quality control, and 4) special analysis steels.

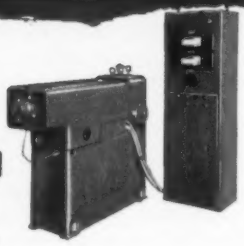
Be sure that every bearing you use in the machines you build or buy is stamped with the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL AND THRUST ⊣○⊢ LOADS OR ANY COMBINATION



WHY CONNEAUT RUBBER AND PLASTICS *switched to* NRM



Conneaut Rubber & Plastics Co., Conneaut, Ohio, specialize in custom extrusions of vinyl and polyethylene compounds to meet highly exacting chemical, physical and electrical specifications. One of the progressive custom extruders who formulate their own compounds, Conneaut has earned a high reputation in the field of difficult and specialized extrusions.

"Running extruders of several makes, side by side," Sales Manager Robert Hunter reports, "we were more and more impressed by the ease with which we could maintain 'texture' and extremely close tolerances in extrusions from our new NRM. The 'balanced heat control' in NRM extruders is a feature that seems to make a whale of a difference. When we check performance, we're more than ever glad we switched to NRM."

Wherever top quality plastics extrusions are produced it's a good bet they are extruded on NRM machines. NRM built the first extruder designed specifically for thermoplastics, designed the first electrically-heated extruder . . . developed balanced heat control . . . and the quick opening die gate.

It is only natural that the leaders in the field of plastics extrusion turn to NRM the leader in the field of plastics extruders.

2118

NATIONAL RUBBER MACHINERY COMPANY NRM Our 25th ANNIVERSARY 1928-1953

General Offices & Engineering Laboratories: Akron 8, Ohio
East: 384 Getty Ave., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Cal.
Export: Omni Products Corporation, 460 Fourth Ave., New York 16, N. Y.

Creative Engineering

For Exceptional Clarity in Films—
look to and through

PLIOVIC
G80V

Properties of PLIOVIC G80V

Composition	100% Polyvinyl Chloride
Form	White Powder
Wet Sieve Analysis	100% through 40 mesh
Specific Gravity	1.40
Bulking Value	44 lb./cu. ft.
Intrinsic Viscosity	0.80
Solubility	Very Limited
Color	None
Taste	None

Here's picture proof—a 30 mil sheet of PLIOVIC G80V—fused at only 310°F. Note the glass-like clarity and complete absence of unfused particles.

Really different is PLIOVIC G80V—newest of the polyvinyl chloride resins by Goodyear.

Just introduced, PLIOVIC G80V is already setting new standards for fast, easy processing and exceptional film clarity at low temperatures. Processing and fusion temperatures as low as 310°-330° F. give increased production at decreased cost – without sacrifice of film quality.

PLIOVIC G80V is carefully polymerized to give the exact molecular structure and weight needed for rapid fluxing. It also is designed to resist heat and light, should extended processing or higher temperatures be used.

Films and sheeting made with PLIOVIC G80V have good physical properties and fabricating characteristics. Where desired, soft stocks for easy coating of fabrics and excellent penetration between fibers are readily produced.

Take a look at the properties of PLIOVIC G80V, then write for samples. Ask also about PLIOVIC G90V. Write to:

Goodyear, Chemical Division, Akron 16, Ohio

Chemigum, Pliobond, Pliolite, Pliovic—
T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

CHEMICAL
GOODYEAR
DIVISION

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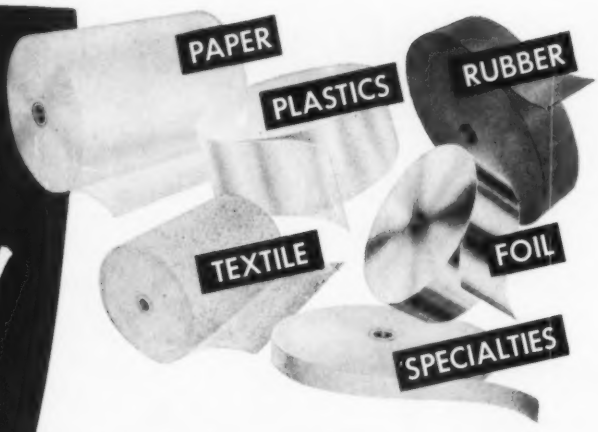
What's Your ROLL Problem!

COST? QUALITY? DELIVERIES?



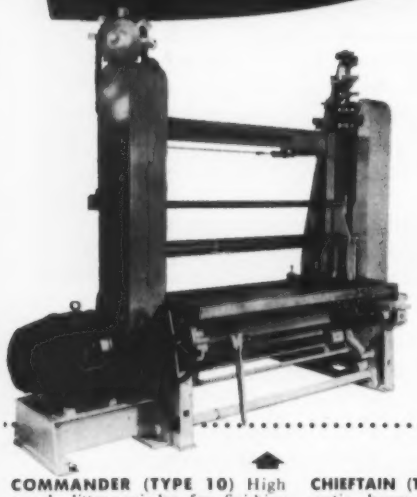
Cost? Even on delicate materials, balanced Camachine construction guards against waste caused by web breaks, wrinkles and spoilage – to save time and money for you – often to improve your final product.

Quality? Thousands of users in many different industries will tell you that Camachines give you cleaner slitting, smoother winding and more sensitive tension control. See how better rolls can build your profits!

Deliveries? Fast, accurate Camachines provide flexibility in production, permitting you to store your basic materials in economy-size mill rolls. Slit and rewind the rolls you want – to the size you want – as fast as you want them.

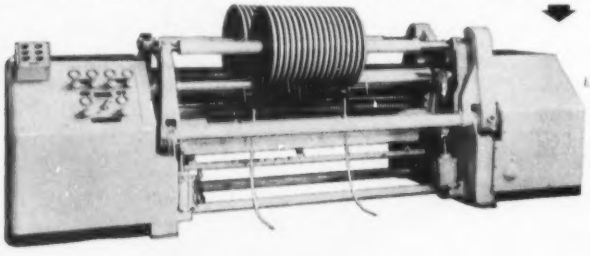
Here's a chance to get right to the heart of your roll production problem. You are invited to consult Cameron for a qualified engineering recommendation on the *right* equipment to meet your requirements. This service incurs no cost or obligation on your part.

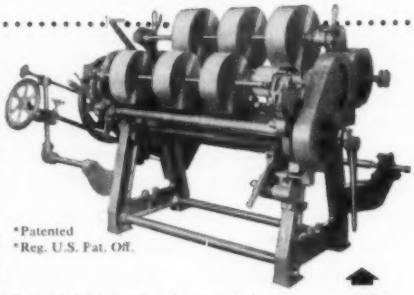
CAMERON MACHINE COMPANY • 61 Poplar Street • Brooklyn 1, N. Y.



COMMANDER (TYPE 10) High speed slitter-rewinder for finishing and converting. Score-cut or shear-cut. Speeds to 2000 fpm. Widths 42"-82". Max. rewind dia. 40".

CHIEFTAIN (TYPE 29) Semi-automatic, heavy-duty slitter-rewinder. Features fingertip control panel. Pneucut* slitters. Speeds to 1500 fpm. Widths 42"-92". Max. rewind dia. 36".





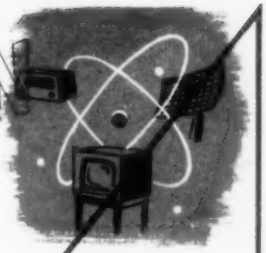
*Patented
*Reg. U.S. Pat. Off.

Type 26 Versatile slitter-rewinder for many different materials including lighter gauge plastic film. May use Pneucut* pneumatic score-cut or razor type slitter elements. Speeds to 500 fpm. Widths 26"-62". Max. rewind dia. 17¾".

LOOK FOR EFFICIENCY AND YOU'LL WIND UP WITH Camachine®

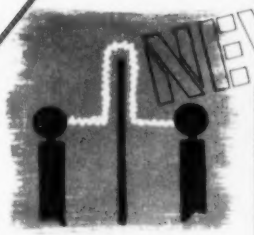
AA-268

NEW



FF-33 fibreglass fabric grade impregnated with arc-resistant resin for excellent low loss electrical properties, dimensional stability and long, dependable service at high temperatures.

NEW



MF-41 fibreglass mat grade impregnated with melamine resin for electrical applications requiring high flame resistance and relatively high arc resistance.

NEW 4 ideas FROM Formica

NEW

S-52 paper base die stock. Smooth, strong, reliable. Fine for forming ductile non-ferrous metals, plastics, wood, rubber, cardboard and paper.

HEADQUARTERS FOR LAMINATED PLASTICS

Here are four brand new ideas in laminated plastics. They can be major aids to improvement of your product, your manufacturing processes, or both. Fill out the coupon below. Send it in . . . we'll speed the details back to you.

FOR FAST FACTS Use coupon for complete information on the 4 new Formica grades shown above. Also ask for your copy of 16-page catalog describing Formica for Industry.

NEW

CH-93 high graphite content. Gives excellent machining qualities, self-lubrication and low moisture absorption. For reciprocating pump packing rings and similar applications.

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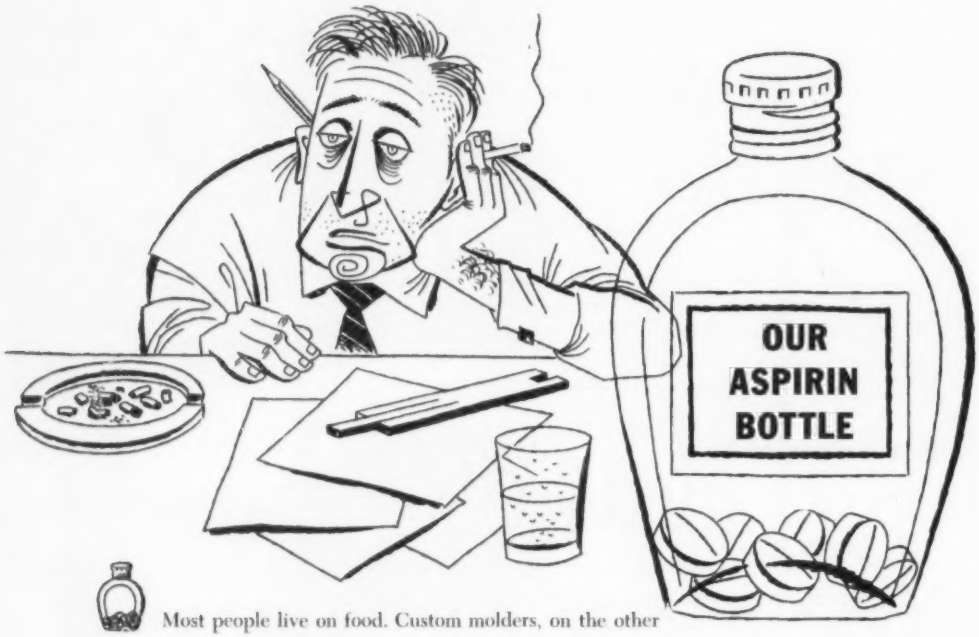
"After the job is over..."



Most people live on food. Custom molders, on the other hand, often seem to live on aspirin tablets and assorted headache remedies. And Boonton's no exception.

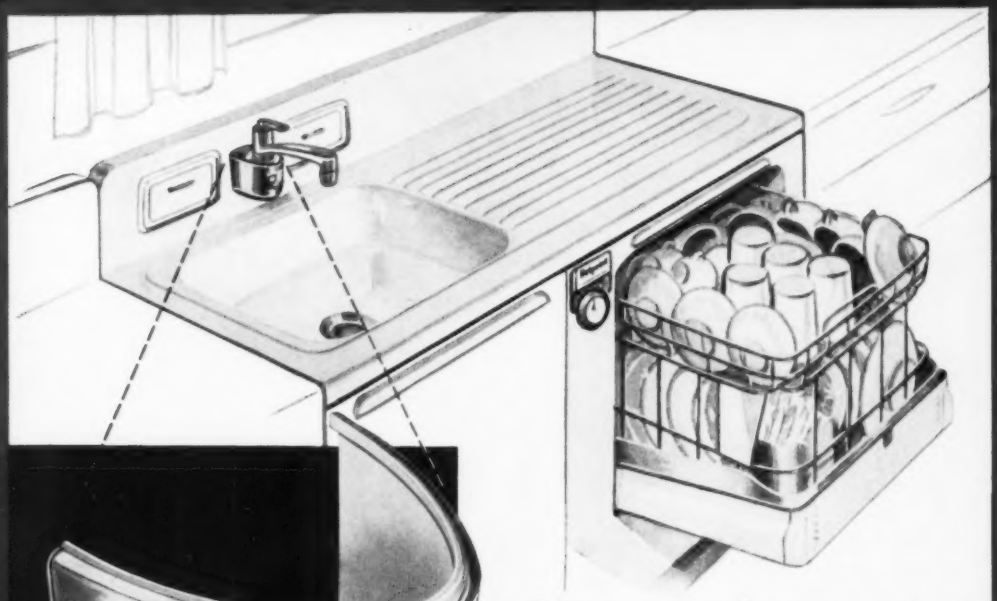
In addition to being paid for the molding we do, we feel part of the price goes for insulating you from the headaches that develop en route. Some of them you are bound to find out about because they are so basic to the production of your moldings that it wouldn't be cricket to proceed without asking. The other headaches, however, we absorb alone, and gulp aspirins in the gloom and silence of the back room. You'll take one, maybe two tablets, for every dozen we down. That's average.

When you order injection or compression moldings from Boonton, the headaches, every one we can keep secret, are ours. All you get is moldings—as perfect as we can make them and at a price that is consistent with the workmanship your product requires.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, MURRAY HILL 6-8540



Chromium housing? Look again... It's molded of PLEXIGLAS

The gleaming faucet housing with projecting crest, on this new Hotpoint combination sink and automatic dishwasher, is metallized molded PLEXIGLAS. By using the acrylic plastic molding powder for the part, designers obtained a notable combination of advantages:

One molding in place of several metal castings. The housing and Hotpoint crest are a single molded unit. No assembly steps are required.

Sparkling color. Brilliant silver and red colors are deposited on the back of the crystal-clear molding where they are protected from damage. For added sales appeal, the Hotpoint nameplate on the dishwasher is also molded of PLEXIGLAS.

Flexibility in design. Multi-curve shapes can be executed without difficulty in this readily molded acrylic plastic.

Serviceability. The resistance of molded PLEXIGLAS parts to heat, hard knocks, and moisture insures trouble-free service through years of daily use.

Combination faucet housing and manufacturer's crest molded of PLEXIGLAS V-100 by Cruver Mfg. Co., Chicago.

Product designers and manufacturers in many fields are specifying PLEXIGLAS molding powder for parts requiring attractive appearance plus strength and stability—for both indoor and outdoor use. Our new booklet gives details and suggests applications. Write to the Plastics Department for it today. If you have a specific problem, our design staff and technical representatives will be glad to offer suggestions.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

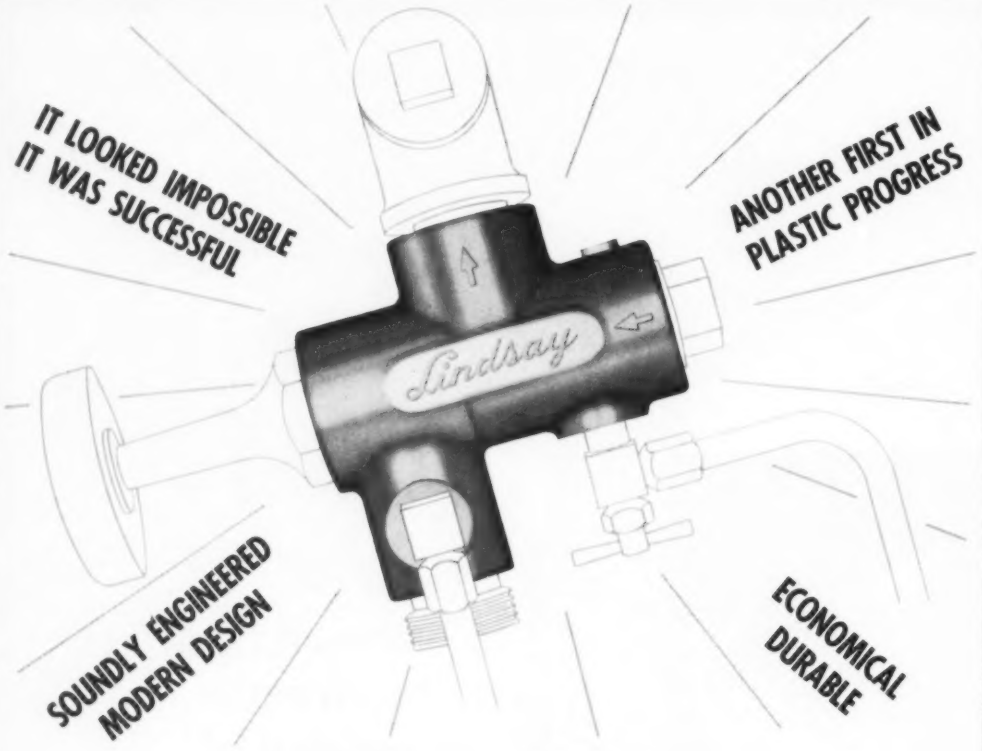
PLEXIGLAS is a trademark, Reg. U.S. Pat. Off. and other principal countries of the Western Hemisphere.

CANADIAN DISTRIBUTOR: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.*

PLEXIGLAS Molding Powders are listed in Sweet's Product Design File, Section 1c/Ro.

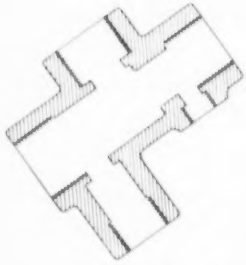
IT LOOKED IMPOSSIBLE
IT WAS SUCCESSFUL

ANOTHER FIRST IN
PLASTIC PROGRESS



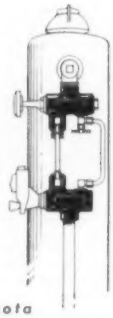
SOUNDLY ENGINEERED
MODERN DESIGN

ECONOMICAL
DURABLE



A plastic water softener valve body designed and engineered to eliminate the high cost of machining the part from metal and to meet severe physical and chemical requirements.

Injection molded of a newly developed thermoplastic material. This unit solved a tough problem.



Manufactured for the LINDSAY COMPANY, *St Paul, Minnesota*

Mincor

MINNESOTA PLASTICS CORPORATION

INJECTION MOLDERS OF THERMOPLASTICS

GArfield 5368 • 366 WACOUTA ST., ST. PAUL 1, MINNESOTA • NEstor 3144

Hooker Chemical Guide
(ONE OF A SERIES)
USE this handy reference to save time in selecting high-quality chemicals.

HOOKER SULFUR CHLORIDES

SULFUR DICHLORIDE

Formula: SCl_2
Molecular Weight: 103.0
Appearance: Brownish red liquid with pungent odor

TYPICAL PROPERTIES

Pour Point	below —78°C
Boiling Point:	decomposes above 40°C
Cl_2 Content	66%
Sp. Gr., 15.5°/15.5°C	1.638
Flash and Fire Point	none

USES

As a chlorinating agent where use of elemental chlorine is not feasible; in chloridizing certain metallic ores; reagent in preparation of organic anhydrides, drying oils and rubber substitutes; reagent for drying coatings of ink, paint or varnish.

SULFUR MONOCHLORIDE

Formula: S_2Cl_2
Molecular Weight: 135.0
Appearance: Yellow to reddish heavy liquid with pungent odor

TYPICAL PROPERTIES

Pour Point	below —80°C
Boiling Point	138°C
Cl_2 Content	52.5%
Sp. Gr., 15.5°/15.5°C	1.6885
Flash and Fire Point	none

USES

As an intermediate and chlorinating agent in manufacture of organic chemicals, sulfur dyes, and rubber substitutes; agent for cold vulcanization of rubber products; polymerization catalyst for increasing viscosity of vegetable oils.

For more information on items listed, drop a note on your letterhead to HOOKER ELECTROCHEMICAL COMPANY, 18 Forty-Seventh St., Niagara Falls, N. Y.

HOOKER ELECTROCHEMICAL COMPANY

NIAGARA FALLS, N. Y. • NEW YORK, N. Y.
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HOOKER® CHEMICALS

2-1527

STRUX*
CELLULAR CELLULOSE ACETATE

Larger Sizes and Lower Prices

We have stepped up production over four times that of last year. That factor, coupled with the development of much larger sizes of this expanded plastic, has made it possible to reduce substantially the price of STRUX.

STRUX is extruded continuously in boards of various sizes ranging from 1/2" x 8" to the newest 2" x 6" . . . in rods of 11/16" to 2-1/4" diameter . . . AND, a new technique employing thixotropic resins enables us to produce large pieces of almost any size or shape.

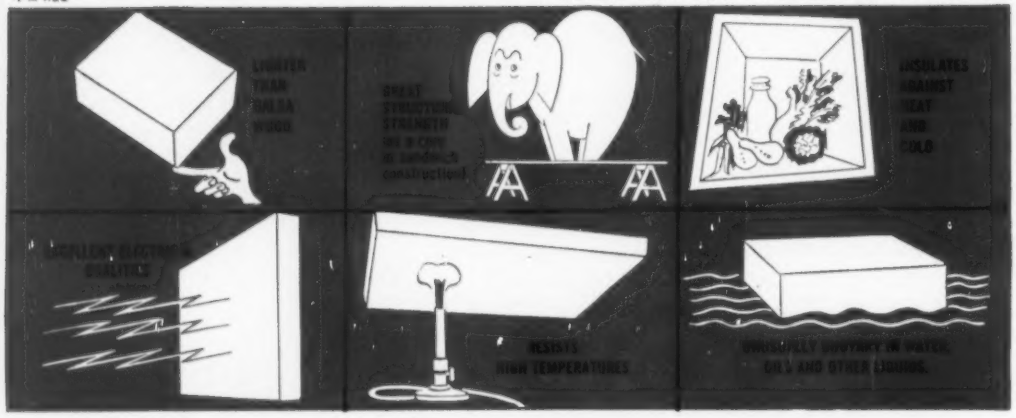
Weighing less than 7 lbs. per cu. ft., STRUX CH-167 has a compressive strength of approximately 200 lbs. per sq. in., is unaffected by extremely low temperatures and will withstand continuous application of 350° F. In sandwich construction, STRUX makes possible a rigid and light weight product with excellent thermal efficiency and good dielectric qualities.

Originally employed in the aircraft and boating industries where light weight and high strength are essential, STRUX is now being used in widely diversified fields.

Our descriptive folder contains the new lower prices and specific data which undoubtedly will suggest how STRUX may be utilized in your industry. Send for it today and request a sample of STRUX. Its characteristics will amaze you.

*T M REG

MANUFACTURED UNDER LICENSE FROM E.I. DUPONT DE NEMOURS & CO.



STRUX CORPORATION

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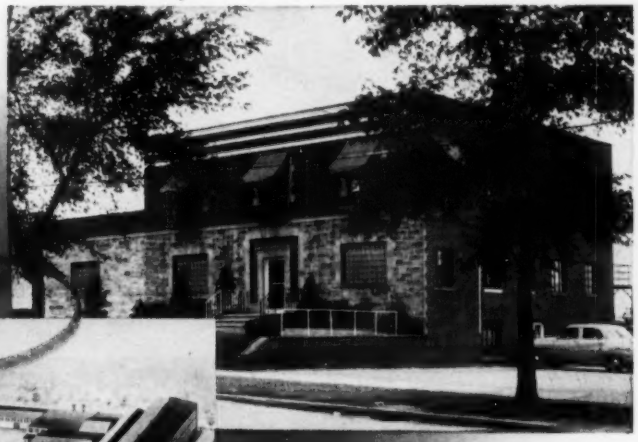
LINDENHURST 5-1700

Representatives in LOS ANGELES • SAN FRANCISCO • SEATTLE • KANSAS CITY • TOLEDO • MIAMI • ATLANTA • TORONTO

The Right Combination for rubber and plastics equipment, planning and processing



An experienced Engineering Organization with the "KNOW-HOW" of rubber and plastics process engineering and machine design.

A machinery manufacturing plant with the "KNOW-HOW" resulting from years of experience in building quality equipment.

the whole job from idea to production or any part thereof

This combination of Hale and Kullgren, Inc., and The Aetna-Standard Engineering Company offers a complete service to the rubber and plastics industry. We are equipped to deliver a complete plant, a specialized process, an engineering service or individual machines for processing rubber and plastics. For instance, some of our current projects are—a Phenolic Resin Molding Powder Plant; a Tire Manufacturing Plant; a Process for Manufacturing Plastic Pipe; a Compounding System and Mill Room for Mechanical Rubber Goods Plant.

We also engineer, build and service the famous National Erie line of rubber and plastics processing equipment.

If you need experienced and competent help in processing or manufacturing—call on us.

your inquiry

Whatever your requirements in plastics or rubber equipment or planning, address your inquiry to:
Hale and Kullgren, Inc.,
P. O. Box 1231, Akron, Ohio.
Give us an outline of your needs and we will give you prompt and authentic information.

National Erie products for the Plastic and Rubber Industries • Extruders • Simplex Doors for Autoclaves • Mills and Hydraulic Presses.

• This old and well-known line of machinery was acquired March 1, 1952, by The Aetna-Standard Engineering Company. They are manufactured in their Warren, Ohio and Ellwood City, Pa., plants. The sales and engineering of the National Erie line is the responsibility of Hale and Kullgren, Inc., Akron, Ohio.

SALES and ENGINEERING by

HALE AND KULLGREN INCORPORATED

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Aetna-Standard

THE AETNA-STANDARD ENGINEERING CO
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Plants in Warren, Ohio
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See us at Booth 1401, ASTE Show, Chicago, March 17-21, 1952.
TOOL STEEL IS OUR FIRST LOVE!
SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES
CRUCIBLE
first name in special purpose steels
TOOL STEELS
52 years of Fine steelmaking
CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL · SYRACUSE, N. Y.

You saw this ad in Tool Engineer, Machinery, Modern Machine Shop, American Machinist, Iron Age.

and our

MOLD STEEL *is* TOOL STEEL

Our reputation was built on tool steel . . . and that means that when Crucible puts mold steel in the same class as tool steel — *you* benefit!

You benefit these ways: we've assigned an experienced metallurgical staff to help you with your plastic mold problems; we back every pound of steel with over 50 years of specialty steel leadership, and we have stocks available from warehouses strategically located from coast to coast.

Crucible mold steel *is* better. It's tool steel.

WRITE TODAY FOR YOUR TOOL STEEL SELECTOR

Get your copy of the unique Crucible Tool Steel Selector — a quick twist of the dial gives you the right tool steel for the right job. And will help in the selection of mold steel. Selector has 9-inch diameter; printed in 3-colors.

CRUCIBLE first name in special purpose steels

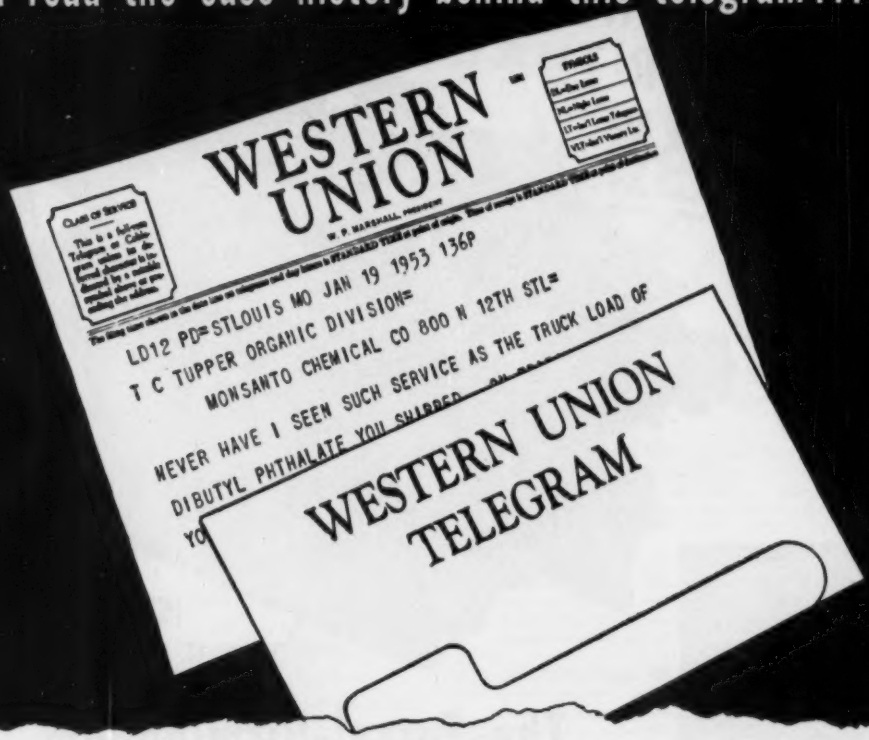
53 years of Fine steelmaking

MOLD STEEL

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

Need fast service on plasticizers?

Then read the case history behind this telegram...


WESTERN UNION
LD12 PD=STLOUIS MO JAN 19 1953 136P
T C TUPPER ORGANIC DIVISION=
MONSANTO CHEMICAL CO 800 N 12TH STL=
NEVER HAVE I SEEN SUCH SERVICE AS THE TRUCK LOAD OF
DIBUTYL PHTHALATE YOU
WESTERN UNION TELEGRAM

Time: Three o'clock on a Friday afternoon.
Place: A Monsanto sales office.

A phone rings. The purchasing agent of a large company 400 miles away is on the wire. He needs forty drums of dibutyl phthalate—*fast.* Can Monsanto help? Monsanto can and does.

Time: Later in the evening of the *same day.*
Place: The receiving department of the company needing dibutyl phthalate.

Headlights cut through the dark and a truck rolls up to the unloading platform. The needed dibutyl phthalate has arrived.

Time: Next morning.
Place: The Monsanto sales office.

A telegram arrives from the company just serviced: "NEVER HAVE I SEEN SUCH SERVICE AS THE TRUCK LOAD OF DIBUTYL PHTHALATE YOU SHIPPED . . . ON FRIDAY . . . WOULD YOU PLEASE SHIP ANOTHER TRUCK LOAD . . . TUESDAY."*

That case history speaks for itself. While it had to do with dibutyl phthalate, it could have been any Monsanto plasticizer, in drum, tank truck or tank car. Although this was an emergency situation, it *does* typify the kind of treatment and service that is a part of every Monsanto order. For full information on how Monsanto plasticizers and resins can help you, contact the nearest sales office or MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.

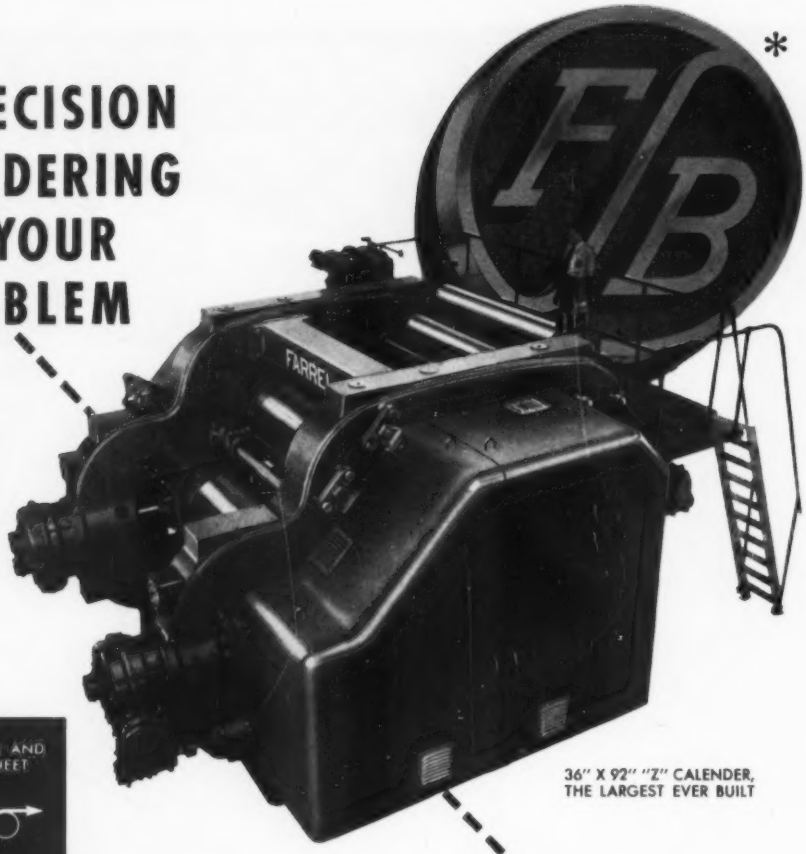
*P.S. With only two working days' notice Monsanto made that delivery, too.

MONSANTO CHEMICALS – PLASTICS

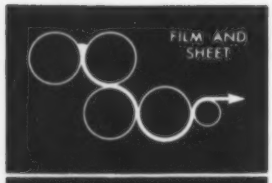
PLASTICIZERS

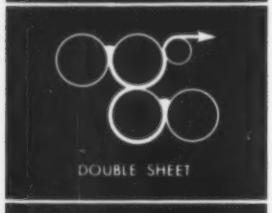
SERVING INDUSTRY . . . WHICH SERVES MANKIND

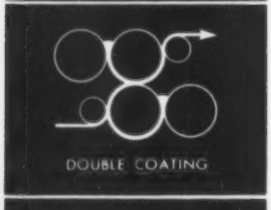
IF PRECISION CALENDERING IS YOUR PROBLEM

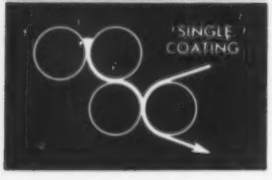


36" X 92" "Z" CALENDER, THE LARGEST EVER BUILT









The Farrel-Birmingham Z* CALENDER is your answer

The "Z" calender has established new standards for accuracy in calendering both rubber and plastics. It has proved to be equally outstanding for the high-speed production of film and sheet, and for single and double coating.

This precision machine was originated and developed by Farrel-Birmingham, the largest producer in the world of rubber and plastics processing machinery.

If precision calendering is your problem, send for further information about the "Z" calender. Ask for a copy of Bulletin 196.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N.Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

FB-808A

F-B PRODUCTION UNITS—Banbury Mixers • Plasticators • Pelletizers • Mixing, Grinding, Warming and Sheeting Mills • Bale Cutters • Tubing Machines • Refiners • Crackers • Washers • Calenders • Hose Machines • Hydraulic Presses • and other Equipment for Processing Rubber and Plastic Materials.

Farrel-Birmingham *®

*Trade-marks of Farrel-Birmingham Company, Inc.

Expanded production facilities will triple Plasticizer production.

By mid-1953, Emery's revolutionary ozone oxidation process will greatly increase the availability of the Plastolein Plasticizers as well as exclusive Azelaic and Pelargonic Acids.

If you are not already using a Plastolein Plasticizer, start an evaluation today. Their lower costs will result in the increased use of certain of these products as basic vinyl plasticizers. Others will be very attractive as specialty plasticizers. All are noted for their low temperature properties, stability to heat and light, low water and oil extraction, low volatility, and excellent "hand" and drape.

Start an evaluation today. Write for samples . . . mail coupon for descriptive booklet.

PLASTOLEIN 9050 DHZ—(di-2-ethylbutyl azelate)—a highly-efficient specialty plasticizer for high clarity vinyl films, coated fabrics, extrusion compounds and other elastomers where low-temperature flexibility is essential. Excellent for non-thickening dispersions.

PLASTOLEIN 9058 DOZ—(di-2-ethylhexyl azelate)—a good all around basic plasticizer that also imparts excellent low temperature properties. Its outstanding combination of properties leads to its use in any vinyl product. Also advantageous for nitrile and GR-S rubbers.

PLASTOLEIN 9055 DGP—(diethylene glycol dipelargonate)—a general purpose auxiliary plasticizer for imparting low-temperature flexibility, excellent "hand" and drape to vinyls. Also, an outstanding low-temperature plasticizer for Neoprene and Buna-N rubbers.

PLASTOLEIN 9250 THFO—(Tetrahydrofurfuryl oleate)—a fatty type plasticizer of unusual stability, providing internal lubrication for superior processing. Also imparts excellent "hand" and drape to vinyl films and sheeting. Its relatively low cost makes it attractive for cellulosics, particularly nitrocellulose, and synthetic rubbers.

PLASTOLEIN 9715, 9720 POLYMERIC—These Polymeric Plasticizers impart extreme durability and weatherability to vinyl materials, yet exhibit the low-temperature characteristics and high efficiency of most monomeric plasticizers. Prolonged exposure to heat and ultraviolet light does not result in appreciable discoloration, stiffening, or sweat-out.

Emery

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

Emery Industries, Inc., Carew Tower Cincinnati 2, Ohio

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401 N. Broad St., Philadelphia 8, Pa.
420 Market St., San Francisco 11, Calif.
187 Perry St., Lowell, Mass.

Warehouse stocks also in St. Louis, Buffalo, Baltimore and Los Angeles.

Emery Industries, Inc., Dept. F-3
Carew Tower, Cincinnati 2, Ohio

Please send me your new book on Plastolein Plasticizers. My plant compounds: .....Vinyls.....Cellulosics.....Synthetic Rubber

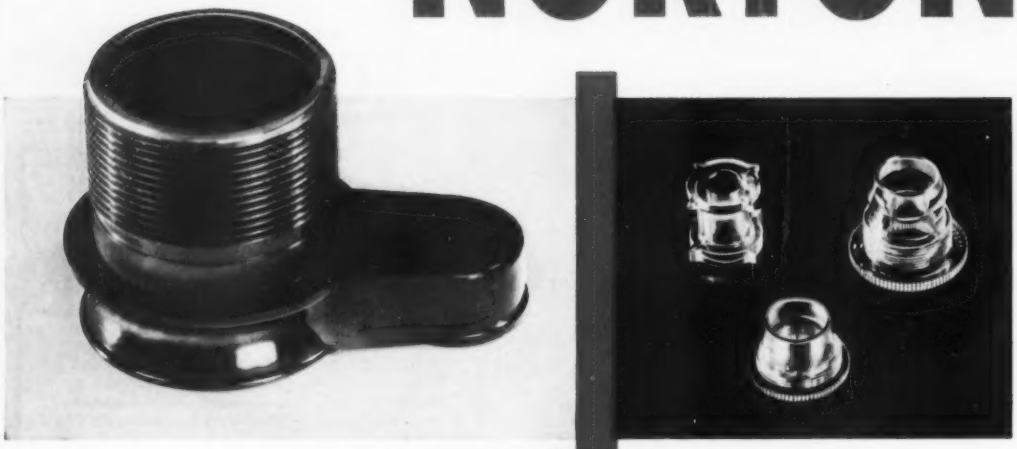
Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

CUSTOMERS have reason to choose NORTON



Customer:

Indiana Brass Company
Frankfort, Indiana

IN ANY INSTANCE of the use of plastics which calls for fine internal and external threads, you can be certain the customer will be *extra* particular and the molder will have to be *extra* careful. In the case of these valve silencer parts for a toilet flush valve which Norton is molding for Indiana Brass Co. (three of the four are threaded), tolerances are all-important; successful operation of the device hinges on close fits.

Norton has been molding these parts ever since 1943. Several times a year, we are asked to supply new quantities, and the customer has come to know that each batch they receive will be as perfect as the last.

Norton knows that close tolerance molding yields satisfied customers and repeat orders. That is why we have always put the emphasis on flawless molding. When this is coupled with Norton's sensible pricing, on-time deliveries, sound engineering and cooperative service, you can see why many users of custom compression and injection molding have been converted to steady Norton customers.

Norton is interested in cultivating your molding business, too. Ask for a free survey of your next molding assignment by a Norton engineer from our nearest sales office. Norton Laboratories, Inc., Lockport, New York. Sales Offices: *New York—175 Fifth Avenue; Chicago—5221 Kimbark Avenue.*

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

Golden Slippers . . . vacuum-engineered for sales

Coty, Inc. hit upon a swank display idea for its famous perfumes, "Emeraude" and "L'Aimant de Coty": Why not send them to market in golden slippers?

Result? What you see in the picture—beautiful slippers made of reclaimed plastic with an untarnishing coat of aluminum that is overcoated with transparent yellow lacquer to look more golden than gold itself.

This delicate skin of shining metal was applied by Vacuum Metalizing Corporation of Long Island City, New York, using high vacuum equipment developed by CVC.

In this mass production process, vaporized aluminum condenses on the lacquer-dipped plastic moldings to form a solid metallic film only 5 millionths of an inch thick. (It takes only a few snips of aluminum wire to coat a great many slippers.) The topcoat of lacquer protects the metal film and provides the gold or other metallic color effects, if desired.

CVC's experience in high vacuum metallizing techniques and associated lacquering operations, opens an almost limitless range of profit-making possibilities for plastics molders—decorative items such as nameplates, escutcheons, costume jewelry, buttons; toys; fabrics; engineering components like electrical capacitators; and so on, almost without end.

We would welcome a chance to discuss specific vacuum metallizing applications with you. Meanwhile, for a copy of the above data sheet describing CVC coating equipment, write **Consolidated Vacuum Corporation, Rochester 3, N. Y.** (A subsidiary of Consolidated Engineering Corporation, Pasadena, Calif.)

CVC

formerly DPi Vacuum Equipment Dept.

Consolidated Vacuum Corporation

high vacuum research and engineering

Versatility

The versatility of vinyl dispersion compounds lend themselves to many wide and varied applications. The "know-how" of the Watson-Standard laboratories can adapt these products to your specific production and end uses.

Molding:

Watson-Standard Vinyl Plastisols and Rigidisols are applicable to both slush molding and dip molding. Such items as doll and doll parts, toys, spark plug covers, electrical components, novelties, puppets, toilet valves, boats, light sockets and others are illustrations of this type of application.

Dipping:

Watson-Standard Vinyl Organosols and Plastisols are readily applied by dipping. Varied end products include dishwasher baskets, dish racks and drainers, electrical wiring, gloves, and springs for the automotive and upholstery industries.

Spreading:

Watson-Standard Vinyl Plastisols and Organosols may be spread coated. Coated textiles and paper are typical of this type of application.

Spraying:

Special foundations of Watson-Standard Vinyl Organosols and Plastisols may be applied by spraying. Finishes for metal furniture, cabinets and blowers are representative uses.

Casting:

Since Watson-Standard Vinyl Plastisols are in liquid form and may be readily poured, they lend themselves to casting. Casting applications include films, sealants for automotive and refrigeration industries, ceramic pipe joint threads, and potting compounds.

Troweling:

Watson-Standard Vinyl Plastisols may be formulated for troweling. This type of application lends itself to linings for tanks and sealants.

The Watson-Standard laboratories can formulate specific compounds for your special end uses and applications. Send us your problem.

Watson-Standard CO.

225 GALVESTON AVE., PITTSBURGH 30, PA.

NEW YORK OFFICE: 15 Park Row, New York 38, N. Y. • CHICAGO OFFICE: 55 E. Washington St., Chicago 2, Ill.

PLASTICS • INDUSTRIAL FINISHES • CHEMICALS

g danger
if not prevented, can place
uipment in constant danger
at the crucial moment of combat.
g anti-icing radomes that
ensable adjuncts of modern aerial
ngineer

The Super High-Speed machine you have been waiting for

THE DOWDING

AUTOMATIC *FAST-CYCLING*

INJECTION MOULDING MACHINE

- Fully automatic and foolproof
- Fast plasticizing at unusually low injection pressure
- 3 zone cylinder heating
- Vickers hydraulic equipment
- Automatic lubrication
- Made in England
- Built to American screw thread standards
- Early delivery

SPECIFICATIONS

Cycles per hour (maximum)	1200
Material plasticized per hour (dependent upon shot size and material)	22 lb.
Area of injection plunger	2.074 sq. in.
Pressure on material at end of plunger	9100 lb./sq. in.
Total pressure on injection plunger	18850 lb.
Mould opens (adjustable)	9 in.
Maximum die space	7 in.
Minimum die space	3 in.
Maximum recommended casting area in mould	15 sq. in.
Size of die plates	10 x 16 in.

DOWDING & DOLL LTD
CABLES ACCURATOOL, LONDON
GREYCOAT STREET, LONDON, S.W.1

After stoning, four grades of ELGIN DYMO are used for mold polishing at KURZ-KASCH, INC. of Dayton—grades 45, 14, 6 and 3 in that order. The work piece is carefully cleaned after each operation and, as shown, separate applicator guns are used for each grade of DYMO

They get finer finishes faster with

ELGIN DIAMOND

...AT KURZ-KASCH, INC., leading Dayton, Ohio, plastic molder...where mold finishing is a vital operation from the cost and sales standpoints. You can be certain of higher quality finishes, and at less cost too, with Elgin Diamond—completely processed at Elgin to assure uniform, predictable polishing results day after day with maximum cutting speed. That's why the leaders in almost every field where finish is important...

Finish with Diamond ... ELGIN Diamond!

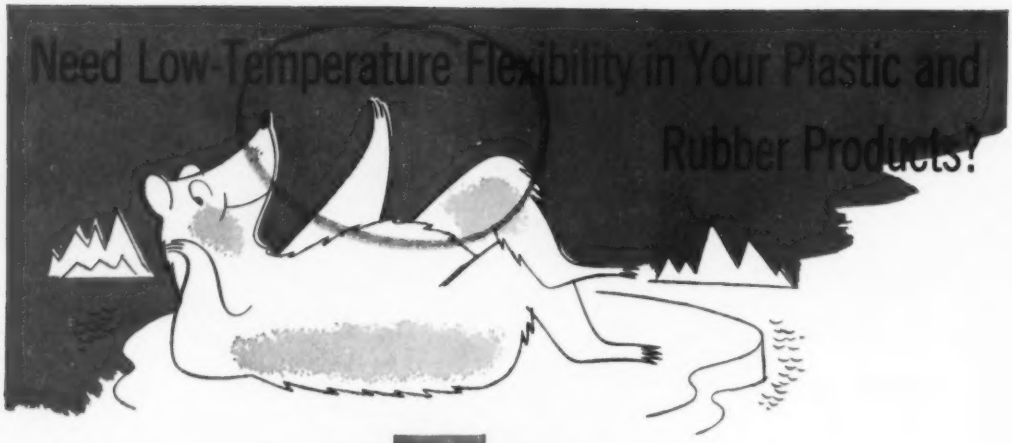
DYMO | **DYMO-C**

...FOR GENERAL POLISHING | ...FOR CARBIDES

ABRASIVES DIVISION
DEPT. M

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS



TAKE A LOOK AT THESE POUR POINTS!*

FLEXOL Brand **plasticizer 4GO** (Polyethylene Glycol Di [2-Ethylhexoate]) **–67.0°F.** . . . An excellent low-temperature plasticizer for the vinyl chloride resins and synthetic rubbers. Rubber stocks containing 4GO have high tensile strength, high elongation, and good resilience.

FLEXOL Brand **plasticizer 3GO** (Triethylene Glycol Di [2-Ethylhexoate]) **–74.2°F.** . . . An outstanding plasticizer for neoprene. 3GO is also an effective processing aid in compounding perbunan types of synthetic rubber.

FLEXOL Brand **plasticizer TOF** (Tri [2-Ethylhexyl] Phosphate) **–101.2°F.** . . . TOF is a recognized standard where *extra* low-temperature flexibility is required. Brittle points as low as –70°C. in vinyl compounds are common with this plasticizer. TOF combines in a single low-temperature plasticizer:

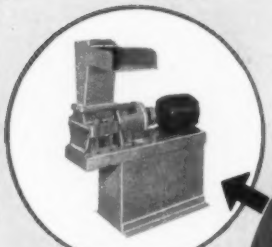
- Compatibility
- Water resistance (an excellent plasticizer for vinyl garden hose)
- Flame resistance—vinyls plasticized with TOF will not support combustion

** Temperature at which the viscosity of a plasticizer is approx. 50,000 centistokes. Low pour points are indicative of good low-temperature properties.*

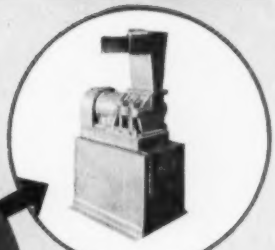
CARBIDE AND CARBON CHEMICALS COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street New York 17, N. Y.

Production of vinyl plastic and rubber products for military use has made low-temperature properties more important than ever before. FLEXOL *plasticizers offer a range of low-temperature properties in combination with a wide choice of other basic properties. For more specific information, write on your company stationery or call any Carbide and Carbon office for our new 76-page* FLEXOL *Plasticizers Catalog (ask for F-5882).*

Flexol" is a registered trade-mark of Union Carbide and Carbon Corporation.

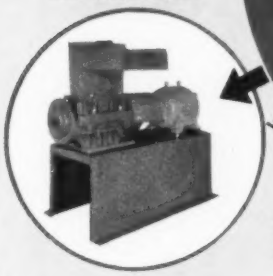


MODEL ½, DIRECT COUPLED

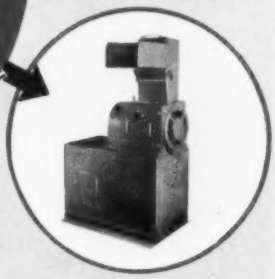


MODEL ½, V-BELT DRIVEN

THE GRANULATOR *YOU* NEED is made by CUMBERLAND



MODEL 18 (LARGE CAPACITY)



MODEL 10 (6" x 10" THROAT OPENING)

YOU'LL GRANULATE FASTER, CUT PRODUCTION COSTS WITH THE CUMBERLAND MACHINE THAT'S BUILT FOR YOUR JOB REQUIREMENTS

Selecting the *right* granulator for your needs is important! By choosing a machine that's best suited to *your* requirements, you'll save materials, time and money.

To make your selection problem easier, Cumberland has developed a complete line of rugged granulating machines — each designed to excel under specific job conditions. The granulator you need is among them.

Cumberland engineers — backed by a practical understanding of your problems and how to solve them — will be glad to recommend the plastics granulator that's right for *you*. Write for details today!

For technical information about Cumberland granulating machines, request Bulletin 250.

OTHER CUMBERLAND MACHINES

PREBREAKER

Cuts up radio, television cabinets and other large parts. Two machines available: Model 32 (20" x 32" throat opening); Model 24 (10" x 24" throat opening). Write for details.

ROTARY CHOPPING MACHINE

Heavy duty, rugged machine. Used for cutting thick vinylite slabs from two roll mills. Also used as large capacity pelletizer. Other applications are described in Bulletin 400.

CUMBERLAND Engineering Company, Inc.

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

DEPT. 1 · BOX 216 · PROVIDENCE · RHODE ISLAND

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

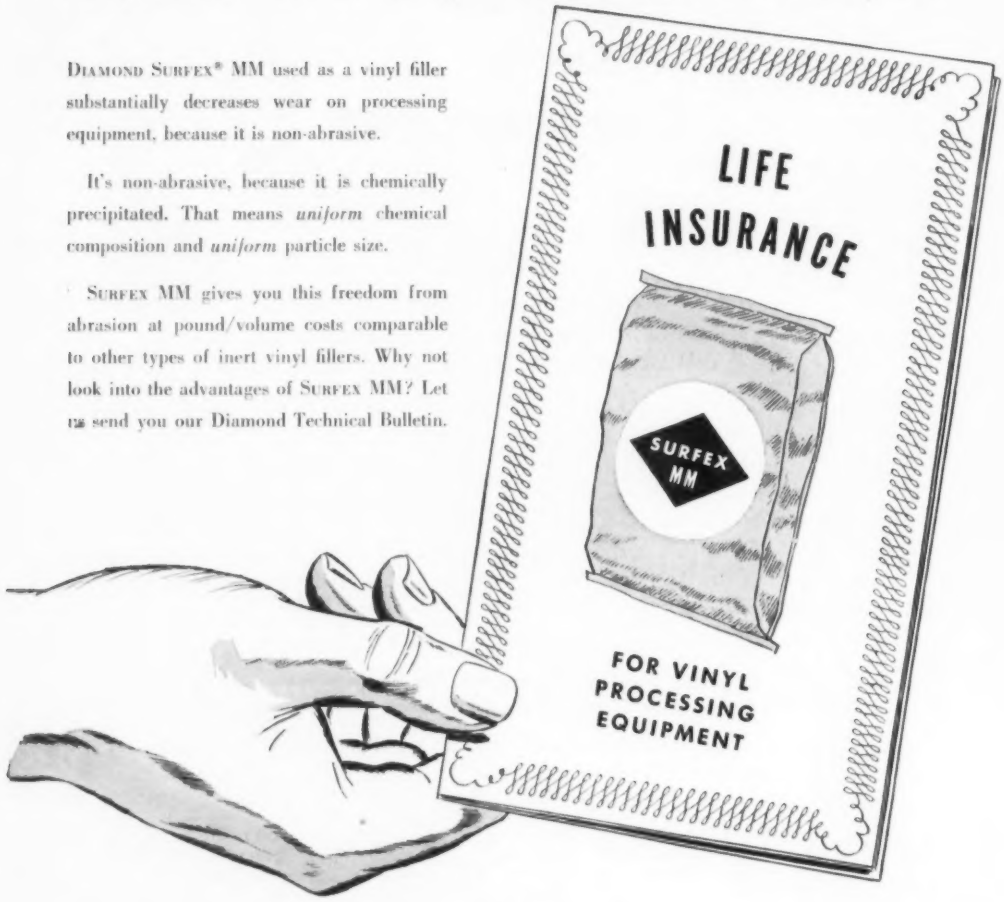
Chemicals you live by

A policy that pays repeated dividends

DIAMOND SURFEX® MM used as a vinyl filler substantially decreases wear on processing equipment, because it is non-abrasive.

It's non-abrasive, because it is chemically precipitated. That means *uniform* chemical composition and *uniform* particle size.

SURFEX MM gives you this freedom from abrasion at pound/volume costs comparable to other types of inert vinyl fillers. Why not look into the advantages of SURFEX MM? Let us send you our Diamond Technical Bulletin.



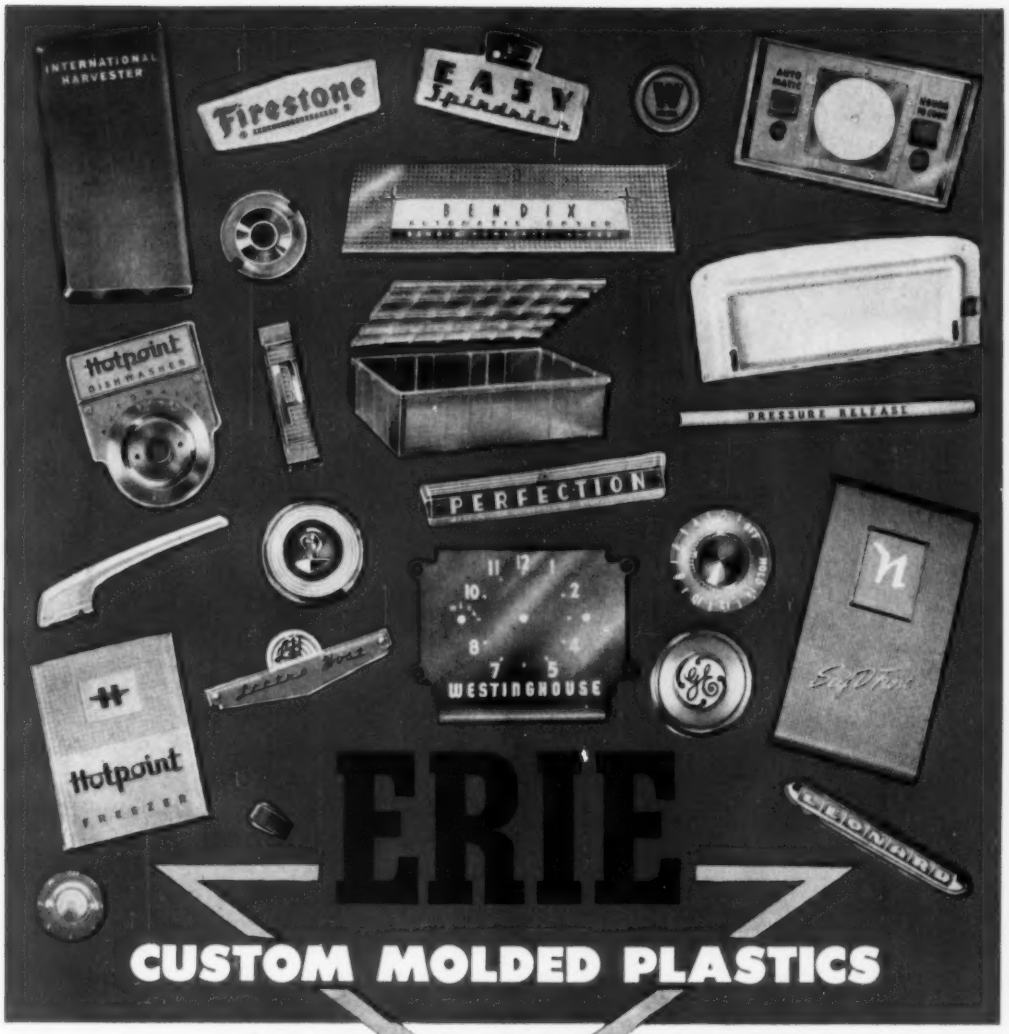
DIAMOND SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis and Houston. Also representatives in other principal cities.

DISTRIBUTORS OF THESE PRODUCTS: C. L. Duncan Company, San Francisco and Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U. S. A.; Harrisons & Crosfield (Canada) Ltd.

DIAMOND CHEMICALS FOR BETTER VINYLS

DIAMOND ALKALI COMPANY...CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS



for Electrical Appliances

Electrical appliances cover a wide range of domestic utility products . . . and Erie covers just as wide a range in custom molded plastic components. Whether it's a three dimensional plate that will at once identify your product and distinguish it—a hidden part upon whose perfect functioning depends the performance of the machine—a conspicuous knob or control which should combine utility with beauty—you will find an appreciation of your problems and an unusual ability in helping to solve them, when you come to Erie for injection molded parts.

Write for your copy of bulletin, "Who We Are . . . What We Do in Plastics."

ERIE RESISTOR CORPORATION . . . PLASTICS DIVISION

Main Offices: **ERIE, PA.**

Sales Offices: Cliffside, N. J. • Philadelphia, Pa. • Buffalo, N. Y. • Chicago, Ill. Detroit, Mich. • Cincinnati, Ohio • Los Angeles, Calif.

Factories: **ERIE, PA. • LONDON, ENGLAND • TORONTO, CANADA**

MUEHLSTEIN

specialists in *Reprocessed* plastics

If you use reprocessed plastics, or sell your plastic scrap or have it reprocessed on a contract basis—you can rely on MUEHLSTEIN for superior service, quality and technical "know-how."

MUEHLSTEIN specializes in reprocessed plastics. Their technical staff is at your service.

Further information and samples on request.

all types of virgin and scrap THERMOPLASTICS bought and sold

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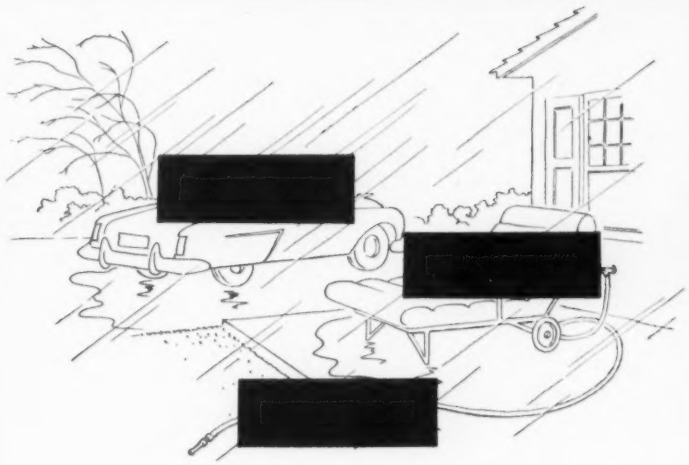
BRANCH OFFICES: Akron • Chicago • Boston • Los Angeles • Memphis



If exposure shortens the life of your vinyl products

. . . stabilize with "Dutch Boy" Dyphos

You can't do much about the weather.

But stabilize your vinyl products with "Dutch Boy" Dyphos, and you'll see that weather can't do much harm to them.

With Dyphos, you'll find that under outdoor exposure your opaque vinyls have excellent color retention and long-lasting flexibility. That's because Dyphos imparts unequaled light stability.

In processing, too, the use of "Dutch Boy" Dyphos works to your advantage because of its excellent heat stability.

So, whether you work with plastisols or organosols . . . whether your method is slush or conventional molding, extruding, calendering, or coating . . . use "Dutch Boy" Dyphos.

For more information on Dyphos (or any of the other "Dutch Boy" stabilizers) just write. We will be glad to supply factual data and technical assistance.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
[redacted]	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Dutch Boy* CHEMICALS

*Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N. Y.

One of the major advances in television reception is the result of Pittsburgh Plate Glass Company research that produced Teleglas. Within less than a year after its first commercial use, this "gray glass" had become the industry's standard facing for cathode-ray picture tubes. The sharp contrasts and the elimination of dazzling brightness, faded grays and "halos" are the contribution of PPG Teleglas to the modern television receiver.

A leader in glass research—and with 70 years' experience in large volume glassmaking—Pittsburgh Plate Glass Company is now drawing upon these skills in the manufacture and development of Fiber Glass. If your products use Fiber Glass—either Superfine Insulation, or Yarns, Strands or Roving—there may be advantages you can obtain by specifying "*Pittsburgh*." You are invited to obtain complete information on facilities for serving you. Pittsburgh Plate Glass Company, 632 Duquesne Way, Pittsburgh 22, Pa.

Making products better, safer, lighter, stronger

If your products need light-weight, durable insulation . . . if they require exceptionally strong reinforced plastics . . . if they need tough, weather-proof, flame-proof fabrics, or highly efficient electrical insulation—then PPG Fiber Glass may be an important factor in your planning. Field engineering service, or product data and other information, may be obtained through executive offices in Pittsburgh, or district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York and Washington.

FIBER PPG GLASS PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Flashlight Housing molded for BURGESS BATTERY CO. Freeport, Illinois

Skillful Molding

solves a flashlight's housing problem

Economical production has a special meaning for us that always results in better plastic products for you. Low priced—high volume items like this Burgess pocket flashlight illustrate how we put economy and quality to work together. Naturally costs had to be kept down while keeping quality "up" in producing this flashlight housing. Although it is a small and outwardly simple case, actually there was a definite and unique problem solved by making full use of a surprisingly compact space. Through careful engineering and advance planning we have developed our own method of cutting costs without ever cutting quality. This production skill that saves you money while giving you a better job is the core of our service to you. Let us show you how we can combine economical production and quality craftsmanship for your product. Tell us today when you want to see us.

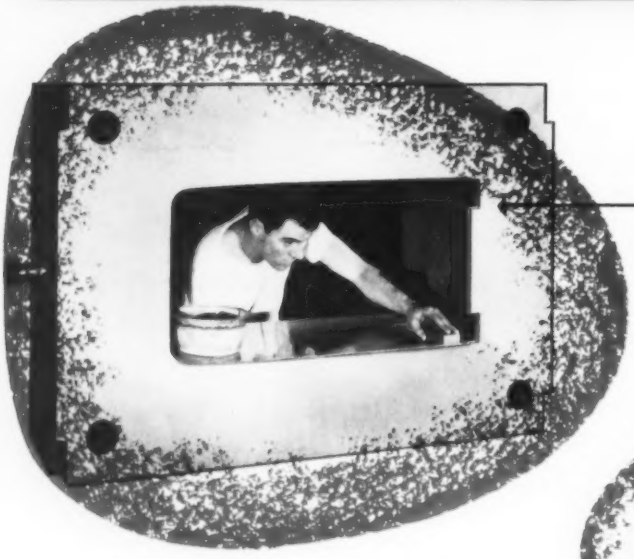
Write on your letterhead for new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [illegible], piping, tubing and fittings, write for circulars containing data and illustrations.*
**Trademark Registered*

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Nylon, Plexiglas, Polystyrene, Styron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Corex, Forticel, [illegible]*, Saran, and other Thermoplastic Materials.

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

Unmatched Facilities
for building your molds



from the largest molds produced in this country

to the smallest and most intricate molds

One of the industry's best-equipped and most ably staffed toolrooms is yours to use, here at **MPc.** Here you will find advanced types of equipment operated by highly skilled, experienced craftsmen.

MPc will make all your molds, operating like your own mold-making department. Or you may wish to call on **MPc** for a single job that won't fit into your production schedule...or a mold that's too large for you to handle ...or one that poses difficult engineering problems. **MPc** *samples all molds, regardless of size, and submits piece parts for dimensional check before releasing molds.*

In pacing the advance to ever-larger plastic castings, **MPc** has acquired an unparalleled fund of experience in mold design, engineering and fabricating. Submit your mold making problems to Molded Products Corporation, 4535 W. Harrison St., Chicago 24, Illinois.

Member: COMMITTEE on LARGE PLASTIC MOLDINGS of the SPI

MOLD MAKING DIVISION

MOLDED MPc PRODUCTS

...Pace-Makers in Plastics Molding

FREE "Data Book of **MPc** Facilities," an engineering-eye view of **MPc** press capacities and other production facilities... together with a survey of **MPc** special skills available for your use. Write for your copy.

Aladdin's Lamp up to date!

Thermatron

HIGH FREQUENCY SEALING AND HEATING EQUIPMENT

Almost like a fairy tale, the stream of new plastic products and improvements made possible by Thermatron continues to dazzle and delight both industry and the consumer. Large and small, complicated or simple, Thermatron electronic sealing has brought about such diverse plastic products as quilted seat covers, handbags, shower curtains, dress forms, drum liners, safety clothing, welting . . . even a plastic bellows for a toy organ! The vast possibilities for home, industry and the military have barely been touched!

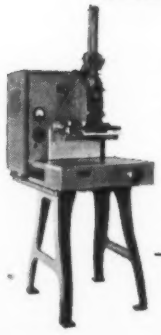
Thermatron offers many other things not mentioned in the Arabian Nights . . . down-to-earth, practical considerations that mean good sense in business:

Quality at a fair price — An assurance that Thermatron gives you the best possible product at the lowest price compatible with high standards.

Economy of production — Enabling you to give your customer a product that is dependable and inexpensive.

Coast-to-coast service and sales — Thermatron, for all its magical aspects, is grounded in a well planned, well organized system of trained representatives and prompt servicing.

30 years experience in Electronics — Your best guarantee that the newest developments are backed by one of the oldest firms in the field. Dependable performance based on solid reputation!



Standard Thermatron models from ¼ KW to 6 KW weld vinyl from .002" up to .080", serving most requirements . . . but if you have a new and special need, we can build to your specifications. Write us for our latest Bulletin No. 71.

Thermatron® DIVISION

RADIO RECEPTOR COMPANY, INC.

Since 1922 in Radio and Electronics

SALES DEPT: 251 West 19th Street, New York 11, N. Y. • FACTORY: 84 North 9th Street, Brooklyn 11, N. Y.

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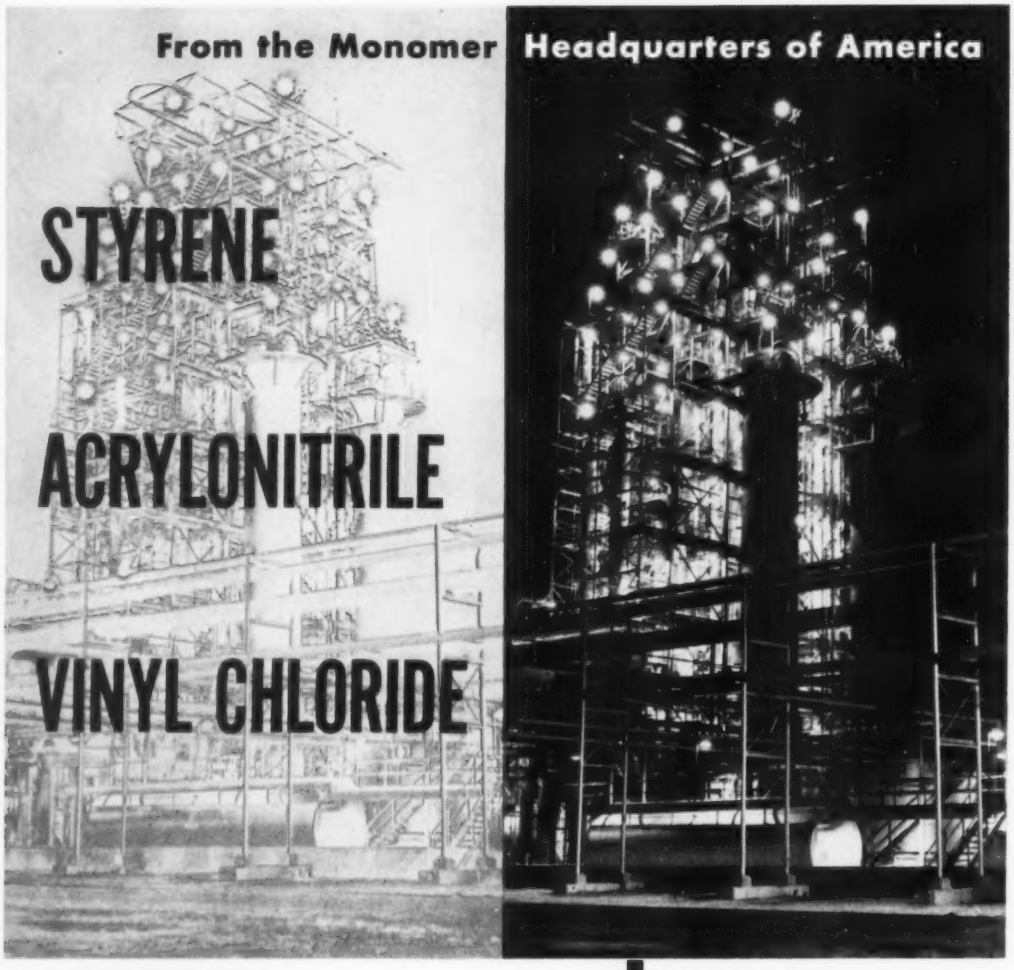


NOW AVAILABLE

to open NEW markets . . . with NEW products

MONOMERS—the big three—are the most versatile organic compounds in industry. Cross-linking monomers with other compounds—even with industrial wastes—is creating new profit-making products at record-breaking pace. New copolymer resins . . . upgrading ordinary "bread-and-butter" products . . . and new roads for organic syntheses . . . these are three great fields for development with monomers.

Example: ORGANIC SYNTHESES. Monsanto styrene monomer containing an aliphatic double bond will react with a large number of organic and inorganic chemicals. Styrene monomer, ammonium hydroxide and sulfur under conditions of the Willgerodt reaction yield phenylacetic acid—a simplified production of a penicillin precursor.

Example: RESIN INTERMEDIATE. Styrene monomer and phenol react to produce para-phenethylphenol. This styrene derivative and formaldehyde polymerize to give an oil-soluble phenolic resin suitable for spar varnish. The resin has good weathering properties and is resistant to acids and alkalis.

These are only two examples. Join this profit-promising chemical exploration of monomer chemistry now that these reactive raw materials are available. Monsanto can furnish you three-star service from the Lone Star state:

★ **TOP QUALITY**... all monomers are FRESH products, highest purity produced in the most modern plant with strict control.

★ **SWIFT DELIVERY** . . . by tank car, tank truck and drum from five strategically located shipping points.

★ **TECHNICAL SERVICE** . . . on storing, handling, inhibiting, catalyzing.

For full information on THE REACTIONS OF MONOMERIC STYRENES, request a copy of Monsanto's study of several hundred reactions. Address request on your company letterhead giving full information so that a Monsanto representative can deliver the book to you personally. Write MONSANTO CHEMICAL COMPANY, Texas Div., Texas City, Tex.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY... WHICH SERVES MANKIND

"I Prefer to Have My Plastic Products Custom Molded by Ideal because..."

Here's how some of our customers completed this statement in twenty-five words or less:

RADIO MANUFACTURER

"...Ideal's delivery of finished cabinets always is closely coordinated with our own production schedule."

PREMIUM SPECIALTY HOUSE

"...we have our product boxed at the molding plant and drop shipped, so we've got to rely on the honesty of our molder's inspection."

REFRIGERATOR MANUFACTURER

"...I find that Ideal gives us the realistic prices we seek without making any compromise on quality."

HOUSEWARES MANUFACTURER

"...we depend on our molder to help choose the material for each of our products, and Ideal has given us wonderful help."

HOUSEWARES MANUFACTURER

"...we frequently double or triple our orders to keep up with the changing market picture and Ideal has facilities to handle the production we want."

ADVERTISING NOVELTY COMPANY

"...they do a splendid job of assembling, painting, and decorating the many molded gadgets and signs we purchase."

Men who make the products and pay the bills appreciate the value of placing their custom injection molding in the competent hands of Ideal Plastics. Our reputation has been firmly established on thousands of satisfactory molding jobs.

Ideal's facilities for mold design and building, production control, molding, and assembling are second to none. For a prompt estimate, contact A. C. Manovill, Vice-President in Charge of Sales. Ideal Plastics Corporation, 184-10 Jamaica Avenue, Hollis 7, N. Y. Phone: AXtel 7-7000. Midwest Representative, Steel Mill Products Co., 176 West Adams Street, Chicago 3, Ill. Phone: Central 6-5136.

Better Molded Plastics Ideal *for Industry & Home*

All business is specialized

. . . and nothing specializes on your business like your business paper

Here's a profit-wise peddler; he picks his corner, not for crowds but for customers. His business is *specialized.* Like yours.

One thing about specializing is the time it saves. Take your business reading. Where else could you find, fast, the vast flood of specific facts, the up-to-the-minute information about new products, materials and methods to keep you posted on your particular field? Much of what you want isn't published *anywhere* else except in this business paper of yours. Its business is to specialize in *your* business . . . to gather, sort out, report and interpret the facts you need.

What's more . . . look at the ads. It may be news to you, but advertisers are spending over $300,000,000 this year to report on their products and services in specialized *business* papers. Your share of that investment is here, in the pages of this paper of yours. Nowhere else can you find such a complete and factful source of everything you need. Time saver? It can be a job saver, a profit saver, a life saver! Read it thoroughly—cover to cover . . . and put it to work!

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a paid circulation paper that must earn its readership by its quality . . . And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.

In April, Modern Plastics brings you . . .

. . . a full explanation of how the small and large molder or fabricator *and his customers* benefit from "scientific spot checking" of production. Informative case histories will demonstrate the savings and other advantages which are possible. This *specialized* article has been written for Modern Plastics by the General Manager of a leading material supplier. Don't miss it!

MODERN PLASTICS 575 Madison Avenue, New York 22, N. Y.

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

Here's a new, modified Polystyrene for large moldings

KOPPERS MC 405 is used for the interior panels of both doors, the freezer compartment and for door shelves in this latest Admiral Dual-Temp Refrigerator. These are excellent examples of the large, accurate moldings which can be formed quickly and easily with this new modified polystyrene.

Each of the sections mentioned above was injection-molded in a single operation, and the speed and ease of molding resulted in a far lower unit cost than would have been possible with conventional construction methods and materials. The light weight of the sections effected substantial savings in freight and storage costs. The MC 405 moldings combine good resistance to shock and impact, dimensional stability, a smooth, attractive finish and low heat conductivity.

The characteristics of Koppers MC 405 suggest it as the ideal construction material for trays, cabinets, strips and other refrigerator parts as well as for housewares, battery cases, toys, containers and displays.

Write today for further information about MC 405 and Koppers other Modified Polystyrenes. If you desire, a Koppers representative will gladly call to discuss the suitability of any of Koppers Polystyrenes for your particular product applications.

Koppers Plastics Make Many Products Better and Many Better Products Possible

KOPPERS®

Koppers Plastics

KOPPERS COMPANY, INC., Chemical Division, Dept. MP-33, PITTSBURGH 19, PA.

SALES OFFICES: NEW YORK · BOSTON · PHILADELPHIA · CHICAGO · DETROIT · LOS ANGELES

Do you have a release problem?

Polyester Molders

You can **INCREASE OUTPUT** per mold

from **10%** to **30%** with

MOLGARD

Thalco's proven chemical compound

Now you can eliminate sticking in your polished matched metal molds by simply adding Molgard directly to the resin. Developed through Thalco research, this chemically stable additive, Molgard (with no effect on color, cure or stability) eliminates sticking and has increased the production rate on molded parts from 10 to as high as 30 percent. By lowering the surface tension, Molgard reduces wetting time and promotes resin flow to further decrease the molding cycle. Write today for free sample and low price list.

A Special Problem?

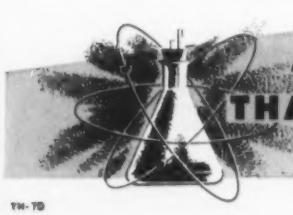
Molders and laminators everywhere are finding the products distributed by Thalco Chemical Supply Corporation the answer to their toughest production problems. If you have a special problem, won't you let our research staff work with you? Simply write us for assistance.

Laminators, Attention!

GARALEASE 915

Created Especially for Polyester and Low Pressure Laminating Resins

Garalease 915 is a lacquer type release agent used successfully for many years and created especially for polyester and low pressure laminating resins. It is easily applied to wooden, plaster and metal molds and because of its fast drying organic solvent, dries to a tough, hard film with no tendency to crack or pull away from the form. Garalease 915 insures positive release and accurate reproduction of the mold surface and has been created for the preparation of void free and mirror smooth surfaces. Write today for free sample and low price list.



THALCO *Chemical Supply Corporation*

YH-7D

767 South Harvard Boulevard, Los Angeles 5, California

Were awards handed out for excellence in moldmaking, it's safe to assume that Newark Die's famed master mold technicians would take the lion's share. These experienced experts who supervise the operation of Newark Die's modern Keller machines, Gorton duplicators, pantograph equipment, Blanchard grinders, precision lathes and heat treating equipment, are in charge of design and construction of all types of molds for the plastics industry.

Working as they do, in the world's largest, best equipped plant for plastics moldmaking, the Newark Die team is responsible for more plastics molds every year than any other single group. Their unmatched ability to produce the molds you want, when you want them, conforming precisely to specifications, should logically lead you to Newark Die for your mold requirements.

The Newark Die team

CHAMPIONS

in all

phases

of

mold making

G. J. SCHUSTER—*Plant Manager*

EXPERIENCE: tool and die making—33 years; in plastics industry—30 years; with Newark Die—30 years.

TRAINING: Fawcett Technical School.

W. J. TRAUTWEILER—
Chief Engineer & Sales Director

Associated with Newark Die for 16 years, most recently Superintendent of the Light Moldmaking Division, Mr. Trautweiler now heads the company's Sales, Engineering, Estimating and Customer Service divisions. Member of SPE and National Tool & Die Manufacturers Association.

ISLYN THOMAS—*General Manager*

Past National President of the SPE, Mr. Thomas is the author of numerous technical articles on mold design, hobbing and mold-making as well as the standard textbook, "Injection Molding of Plastics." He is one of the country's foremost authorities on plastics engineering.

E. W. SPITZIG—
Superintendent, Hobs and Cavities

EXPERIENCE: tool and die making—40 years; in plastics industry—26 years; with Newark Die—26 years.

TRAINING: Newark Tech.

HARRY TAYLOR—*Chief Estimator*

EXPERIENCE: with Newark Die—21 years; in plastics industry—21 years.

TRAINING: Newark School of Fine & Indus. Arts.

VICTOR P. BERGQUIST—
Superintendent, Moldmaking Division

EXPERIENCE: tool and die making—20 years; in plastics industry—18 years; with Newark Die—18 years.

TRAINING: Newark Tech.

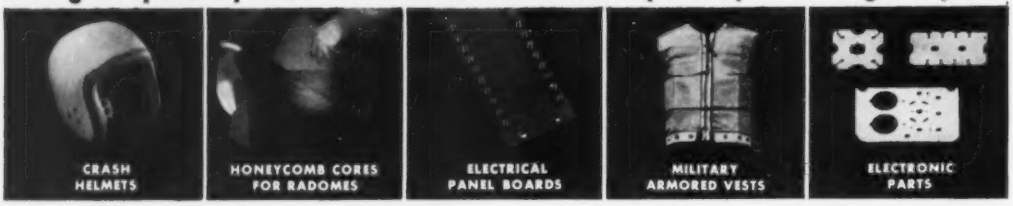
M. G. WOHLLEBEN—*Chief Designer*

EXPERIENCE: in tool and die making—27 years; in plastics industry—17 years; with Newark Die—17 years.

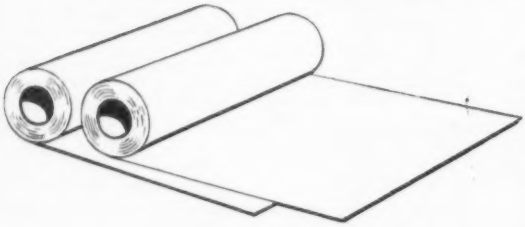
TRAINING: Stuttgart Technical School.

NEWARK DIE COMPANY

Fine glass-plastic products like these owe their superiority to fine glass yarns



Why should these fine *VITRON GLASS YARNS* interest you?



Because the quality of your product depends on the evenness of the fabrics you buy . . . and the evenness of the fabrics depends on the uniformity of the glass yarns. Glass Fibers Inc. uses its own independent electronic-extrusion process to produce glass fiber filaments of consistently uniform diameter. These filaments are supplied to weavers in the precise yarn construction and package they need to weave your reinforcing fabric. *For information and samples write Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.*

Standard packages of Vitron Yarns are the TWISTER TUBE (1¼ pounds of yarn) and the STANDARD CONE (3 pounds of yarn).

VITRON ROVING

Uniform glass strands, treated and finished to be compatible with plastics, form the neat ribbon of Vitron Roving. The ribbon end is easy to find because the package has a large center opening. Packaged with special care, Vitron Roving is supplied to manufacturers who require unfrayed strands in a smooth-feeding ribbon that separates readily in process.

GLASS FIBERS INC.

Makers of glass fibers by the ELECTRONIC-EXTRUSION process . . . developed, patented and used exclusively by Glass Fibers Inc.

VITRON Yarns • Rovings • Micro-Fibers • Pipe Wraps • Industrial Mat • MICROLITE Thermal-Acoustical Insulation • DURAMAT Vapor Barriers • VIBRAGLASS Machinery Mounting and Packaging Materials • COUSTIC-AIRE and THERMO-JET Aircraft Insulations.

Gering is Geared TO SERVE THE ENTIRE PLASTICS INDUSTRY

a complete **PLANT**

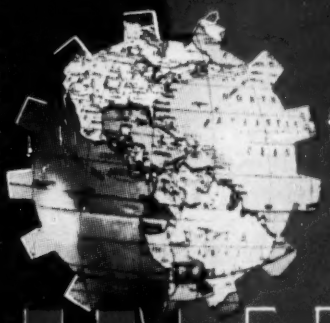
for a complete **SERVICE**

WE MANUFACTURE Virgin Thermoplastic injection and extrusion molding compounds, standard and special formulations . . . Polystyrene, Polyethylene, Acetate, Acrylics, Ethyl Cellulose, Vinyls.

- **WE BUY THERMOPLASTIC SCRAP** — all types and forms: Polystyrene, Vinyls, Nylon, Ethyl Cellulose, Polyethylene, Acetate, Butyrate, Acrylics.
- **WE CUSTOM COMPOUND** your materials, and offer these special services: Sorting, De-contaminating, Color-Matching, Pelletizing.
- **WE EXTRUDE** any flexible or rigid formulation which you plan, for any special-shaped Belting, Binding, Edging, Rods, Tubes, Film, Strips . . . in Polystyrene, Cellulose Acetate, Polyethylene, Vinyl, Butyrate, Ethyl Cellulose, Acrylics.

DRYCOL —offered as Gering's perfected dry coloring medium for in-plant coloring of ALL PLASTICS. No special skill or equipment needed. Standard, Special and Metallic colors available or to order.

Our service is world-wide . . . etched over the years thru eternal self-discipline for Quality, Perfection, Delivery. Consult our Technical Service Department.

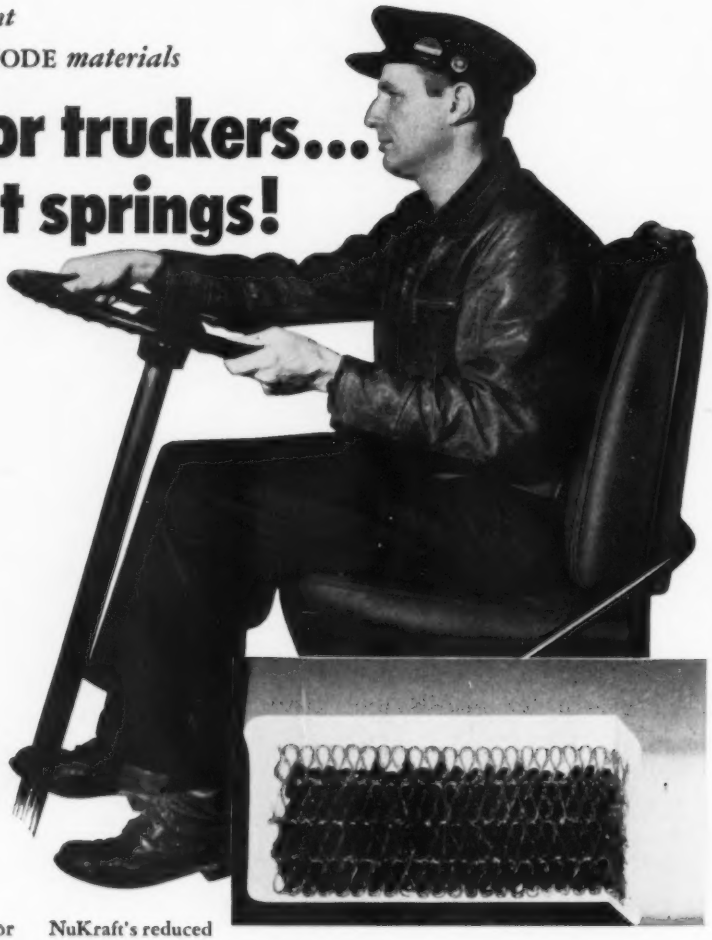


Our 36 years' expert know-how and large facilities. Your guarantee of complete satisfaction.

GERING Products INC. KENILWORTH, N. J.

Another new development
using AMERICAN ANODE *materials*

Comfort for truckers... without springs!



THERE'S comfort in the cab for truckers with this NuKraft foam pad. It gives all the soft density of foam rubber plus "backbone" of sterilized, American Anode, latex-dipped hog hair—a special NuKraft construction.

Lateral stability, important to drivers, is assured by these pads. There is no tendency to "bottom". One thickness does the job so that there's more leg and head room. NuKraft's reduced weight makes it ideal for aircraft seating, and for other uses where its advantages can bring improvements and economies.

It's another example of how American Anode helps manufacturers develop and improve profitable products. For American Anode latices, resin pastes and other materials have a wide variety of uses. Applications range from coatings and fabrics to a plastic modeling compound and a method for printing permanently on rubber!

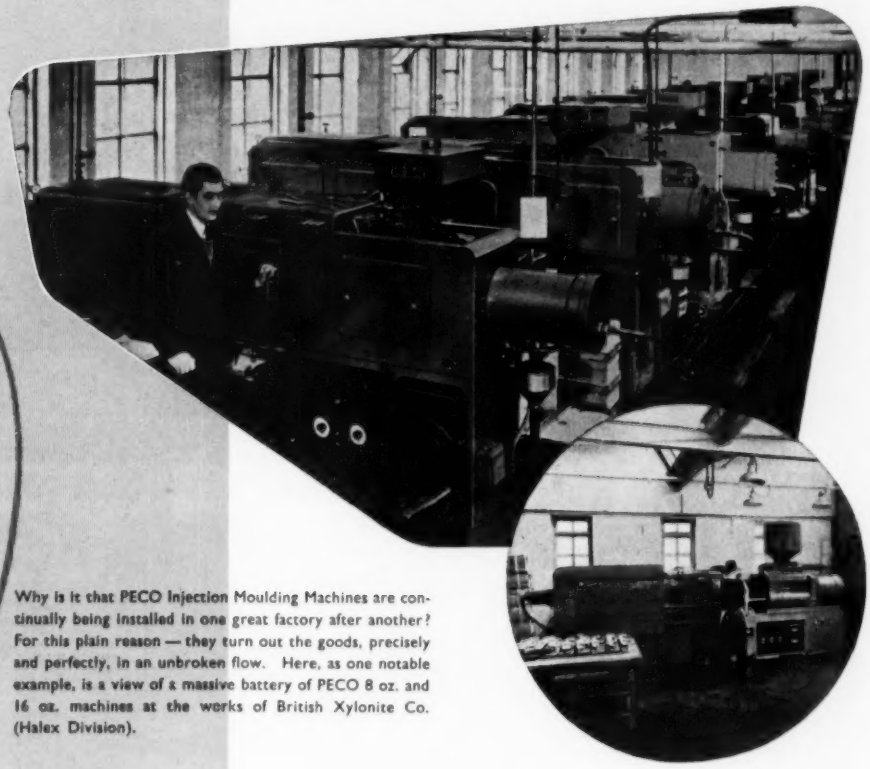
Perhaps our wide experience can help you produce more saleable products—cut costs, too. For helpful information, please write Dept. AD-2, American Anode, 60 Cherry Street, Akron, Ohio.

AMERICAN ANODE

A Division of The B. F. Goodrich Company

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS,
AMERAN RESIN PASTES, COMPLETE MANUFACTURING FACILITIES

And Why is It Happening?



Why is it that PECO Injection Moulding Machines are continually being installed in one great factory after another? For this plain reason — they turn out the goods, precisely and perfectly, in an unbroken flow. Here, as one notable example, is a view of a massive battery of PECO 8 oz. and 16 oz. machines at the works of British Xylonite Co. (Halex Division).

MOULDS

PECO MOULDS. Expert designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if required. An important side of the Company's work is the hobbing of cavities for moulds and medallions — the plant includes a 3,000 ton hobbing plant. Master hobs to customers' samples made as required.

PECO PRODUCTS

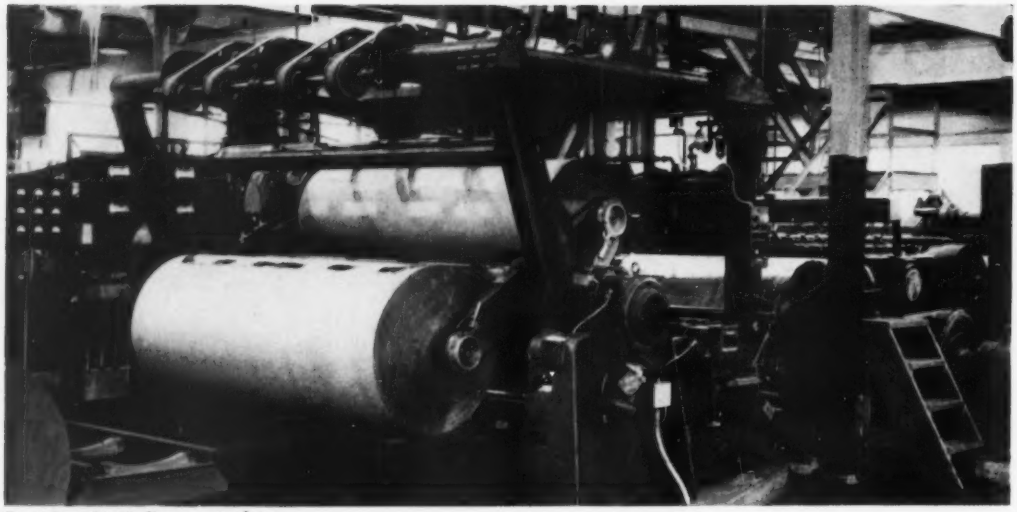
PECO Injection Moulding Machines are supplied in 2, 4, 8 and 16 oz. capacities. They are self-contained with automatic cycle and are hydraulically operated. They have a high plasticising capacity and rate of injection. Mould-locking pressure and platen area enable them to operate at a high rate of production.

Full particulars of the PECO range of Injection Moulding Machines and Moulds will be sent on request.

The PROJECTILE & ENGINEERING COMPANY LTD.

ACRE STREET, BATTERSEA, LONDON, S.W.8

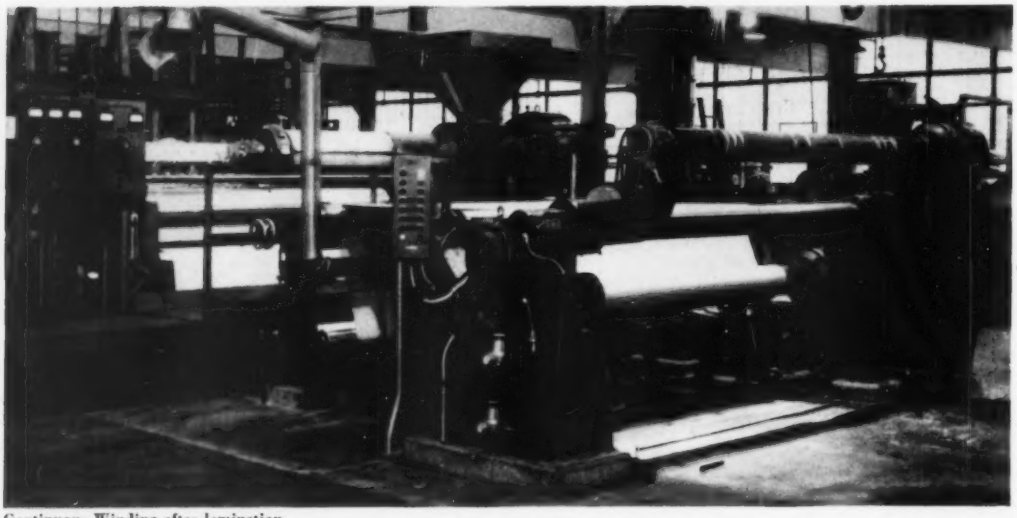
Telephone: Macaulay 1212. Telegrams: "Profectus, Claproad, London". Cables: Profectus, London



Continuous Unwinding to extruder

Polyethylene Laminated to Paper Without Stops for Roll Changes

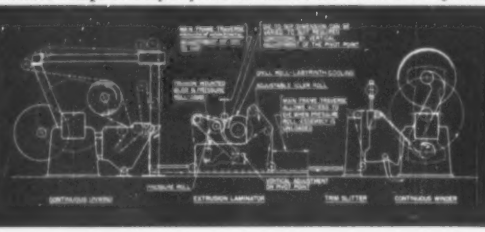
Extruder-Laminator at St. Regis Paper Co., Carthage, N. Y. Employing Kohler System reels; the operation is continuous. ***Write for DOM-8 for details.***



Continuous Winding after lamination

Dilts manufactures complete Polyethylene Laminator for continuous operation

Dilts
machine works
Fulton, New York
Division of
THE BLACK-CLAWSON COMPANY, Hamilton, Ohio

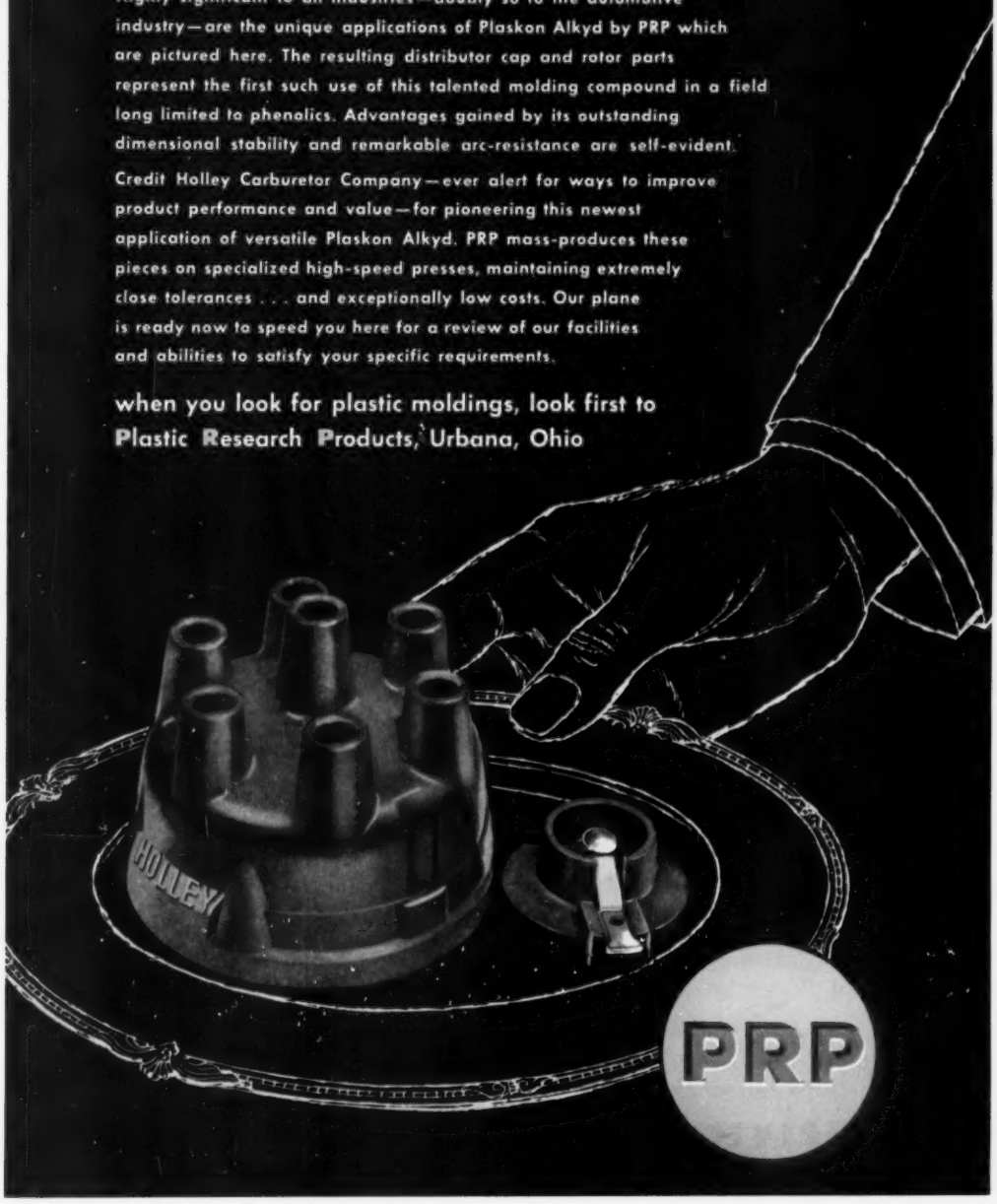


plaskon alkyd 420 forms another "first" handed to our customers

Highly significant to all industries—doubly so to the automotive industry—are the unique applications of Plaskon Alkyd by PRP which are pictured here. The resulting distributor cap and rotor parts represent the first such use of this talented molding compound in a field long limited to phenolics. Advantages gained by its outstanding dimensional stability and remarkable arc-resistance are self-evident.

Credit Holley Carburetor Company—ever alert for ways to improve product performance and value—for pioneering this newest application of versatile Plaskon Alkyd. PRP mass-produces these pieces on specialized high-speed presses, maintaining extremely close tolerances . . . and exceptionally low costs. Our plane is ready now to speed you here for a review of our facilities and abilities to satisfy your specific requirements.

when you look for plastic moldings, look first to Plastic Research Products, Urbana, Ohio

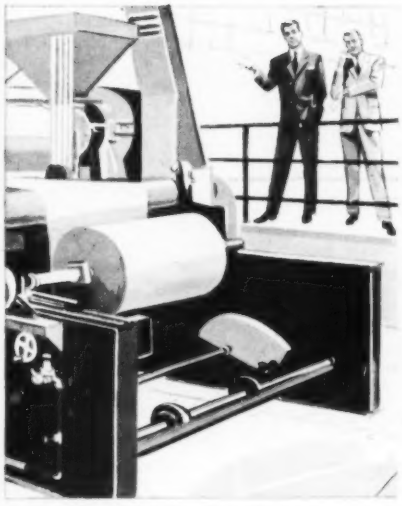


a Better Product means a Better Profit!

LET Firestone TECHNICAL SERVICE

SHOW YOU HOW *EXON* RESINS OFFER

• a shortcut
• to a better
• product!



The Firestone EXON line of resins offers many valuable properties to industrial manufacturers. In numerous applications, these resins can improve your product while they cut production costs.

In addition, to help you utilize EXON resins to your fullest advantage, the Firestone Chemical Sales Division makes the following technical services available to you:

1. The assistance of highly trained plastics experts who will be glad to help you design compounds based on EXON materials for specific applications.

2. Use of Firestone's testing facilities to:

a. Test *physical properties* such as Elongation, Tensile Strength, Tear and Impact Resistance, Stiffness and Thermal properties.

b. Examine *chemical properties* such as resistance to Acids, Alkalis, Fats and Soap Solutions.

c. Test *aging properties*, Weathering, Light Stability, Retention of Color and Physical Properties.

d. Conduct *Specific Application Tests.*

3. Consultation with Firestone's Technical Service for information on processing problems, product and process development.

In short, consult Firestone *whenever* you have a question or problem on which you would like assistance.

Find out how Firestone EXON *combined with Firestone's Technical Service can help you produce a better product at a lower cost. Write or call:*

CHEMICAL SALES DIVISION

FIRESTONE PLASTICS CO., POTTSTOWN, PA., DEPT. 10B

Division of Firestone Tire and Rubber Co.

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

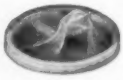
The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Great Britain Patent 662,219 829,248 September 25th, 1949. Germany Patent September 27th, 1949. Argentina Patent 96,970 September 30th, 1949. Brazil Patent 39,676 December 29th, 1951. Mexico Patent 51,615 January 3rd, 1952. Other U. S. and Foreign Patents Pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.



TUPPER /

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

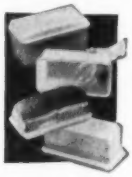
Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

TUPPER CORPORATION

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

Factories, Laboratories and Sales Offices: Farnumsville, Mass., Orlando, Fla., L'Epiphanie, P.Q. Showrooms: 225 Fifth Ave., N. Y. C.

ADDRESS ALL COMMUNICATIONS TO: Department M-3

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I.C.I. PLASTICS

Serve the Aircraft Industry

The prototype Comet II. *Photo. by courtesy of the De Havilland Aircraft Co. Ltd.*

There are few British aircraft in which I.C.I. plastics are not used somewhere, whether it be in the manufacture of radomes for night fighters, or p.v.c. fabric for the interior decoration of new airliners.
I.C.I. Plastics have contributed much to the success of the De Havilland Comet—the world's first jet airliner.

'Nuron', 'Perspex', 'Alkathene', 'Welvic', and 'Fluon' are Registered trade marks in the United Kingdom, the property of Imperial Chemical Industries Limited.

The plastics widely used in this aircraft are:

'NURON'—low pressure contact laminating resin used with glass cloth in the fabrication of large and small ventilation pipes, fume ducts, wing tips, fan casings, etc.

Advantages: simple and inexpensive fabrication, low weight of mouldings, toughness.

'PERSPEX'—acrylic sheet for pressurised cabin windows (including inner framing), lighting fittings, toilet fitments, accessories, etc.

Advantages: ease of fabrication, low weight, toughness, excellent weathering properties.

'ALKATHENE'—brand of polyethylene for radar cable insulation.

Advantages: low power factor, lightness in weight, ease of extrusion.

'WELVIC'—polyvinyl chloride for electric cable insulation.

Advantages: ease of extrusion, resistance to abrasion, available in non-inflammable grades, made in a wide range of colours for easy cable identification.

'FLUON'—polytetrafluoroethylene, a special high-frequency dielectric.

Advantages: unaffected by high temperature or corrosive fluids.

ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED
Plastics Division, Welwyn Garden City, Herts, England
U.S.A. enquiries to **J. B. HENRIQUES, INC.**
521 Fifth Avenue, New York, 17 NY.

P.233M

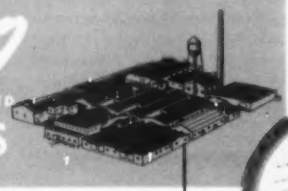
The new work horse of Industry

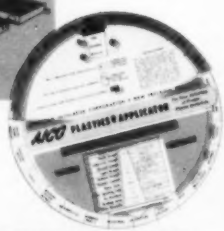
Molded plastics are a powerful tool in the hands of economy-minded fabricators who are looking for tougher, longer-lasting materials that cost less. There are plastic materials as strong as steel . . . light as aluminum . . . extremely resistant to heat, even up to 1000° F. Plastic parts can be molded to close tolerances to reduce fabricating costs, eliminate many production steps entirely.

free AICO plastics applicator picks the *right* plastic for your product

A TURN *of its dial automatically selects the three best plastics for each purpose . . . lists complete physical properties . . . even indicates the best molding method. Send for your Plastics Applicator and hitch the new work horse of industry to your production problem. Mail the coupon today.*

AICO
PRECISION MOLDED
PLASTICS





American Insulator Corporation
New Freedom, Pennsylvania

Please send my free Plastics Applicator immediately.

NAME: _____

POSITION: _____

COMPANY: _____

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MODERN PLASTICS

MARCH 1953 VOL. 30, NO. 7

Courtesy Monsanto Chemical Co.

Housing is molded in Pro-phy-lac-tic Co. plant on 300-oz. Watson-Stillman—largest injection machine ever commercially built. Platen area is 6 ft. wide by 4 ft. high; clamp is 1500 tons

Courtesy A. L. Hyde

Operator lifts a smaller housing from the force plug of a single-cavity injection machine

BATTERIES ...Improved with Plastics

Longer life and higher efficiency in batteries of all kinds are being gained by taking advantage of properties of many different plastics

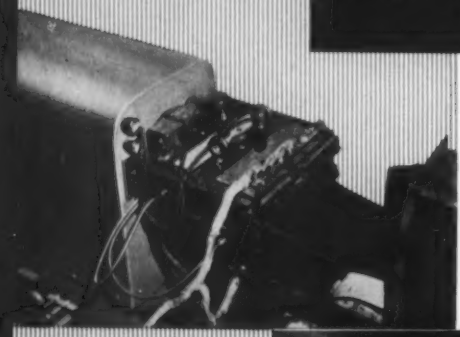
INTENSIVE research aimed at improving the efficiency and useful life of batteries of all kinds has shown the shortcomings of such conventionally used materials as wood, glass, and rubber. Better properties such as thermal resistance, cold flow, shock resistance, resistance to corrosion and oxidation, and dielectric strength were wanted. In addition, lighter weight has been sought. It is only natural that the leading manufacturers of batteries have turned to plastics to find these needed properties.

No one plastic material has been able to fulfil the many and varied requirements for different battery components. But thanks to the availability of scores of plastics materials and literally hundreds of different formulations, plastics are now playing a major role in making the batteries of today far superior to their predecessors.

One of the leaders in this field is Electric Storage Battery Co., Philadelphia, Pa., which reports that the following different materials are now being successfully used in one or more storage battery applications. Styron 671 and Koppers styrene 8X (both crystal styrene); Dow 475 and Koppers MC-185 (both opaque styrene copolymers); Bakelite C-11 and Dow Q 767 (both modified styrenes); rigid Vinylite; Marvinol polyvinyl chloride (specially compounded and treated to achieve porosity); Alathon 1 and Bakelite DYNH (both high molecular weight polyethylenes); Lucite; and Styrofoam.

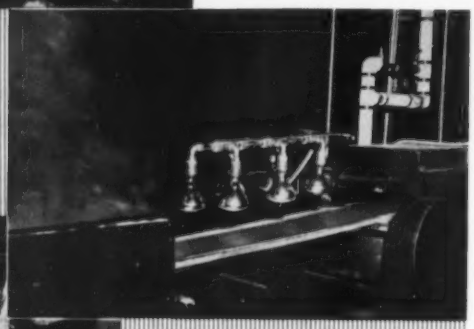
Transparent styrene is used to replace glass for battery jars in many stationary applications. The physical properties that make this material valuable are high thermal

PRODUCTION OF POROUS VINYL BATTERY SEPARATORS



Courtesy Stokes Molded Products, Inc.

Set-up for production of porous vinyl battery separators begins with extrusion of compound (above) in the form of a belt two separators in width. Belt passes from die into solvent recovery oven (left) and then passes under a bank of infra-red lamps (below) and into a hot swelling bath. After drying in oven (below, left), belt is delivered to last station for cutting, inspection, and separation into two parts (bottom)



resistance, ability to withstand shock, good cold flow properties, and lightness. A heat distortion point of 185° F. assures retention of shape and dimensions. The cold flow factor makes for a better seal when nuts are tightened on terminals. Impact resistance reduces breakage in handling and shipping.

Because equivalent strength is obtained with styrene in thinner sections than with glass, it is possible to make better batteries with smaller jars. Weight reduction results in easier handling and lower transportation cost. Further, styrene containers and covers can be made at a lower cost than glass, once the original cost of the mold is written off. Styrene has a high dielectric value in comparison with other materials that might be used in battery jars. It is non-porous and is impervious to the corrosive effects of sulfuric acid used in lead-acid battery electrolytes.

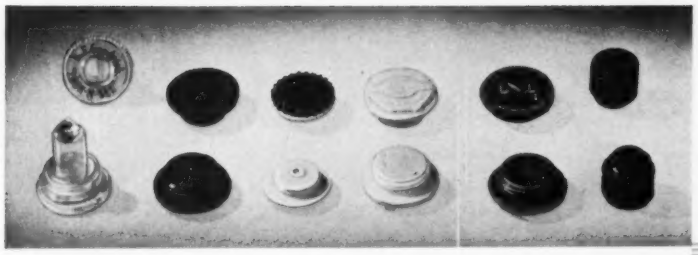
Opaque copolymer or modified styrene also is used in battery jars and covers. This material possesses superior impact qualities as well as all the other desirable characteristics of transparent styrene. Electric Storage Battery Co. uses this material in both black and white, each for a specific type of battery.

Guards Against Damage

Plastics are also used in other battery components. These include separator protectors, which guard tops of battery separators against damage from testing and filling equipment inserted into the cells through filler vents; baffle covers to make telephone batteries explosion-proof; vent plugs; and slotted retainer sheets which retain the active material in battery plates. In the last named application, styrene has proved superior to the rubber formerly used. Its high resistance to oxidation contributes to longer battery life.

Modified styrene, because of its lightness, strength, and ability to withstand the corrosive action of alkaline electrolyte solutions, is replacing glass jars in many telephone batteries. This material also is proving useful in special aircraft battery applications because of its good resistance to oil.

Polyvinyl chloride lends itself to extrusion and to a special chemical treatment which makes the finished

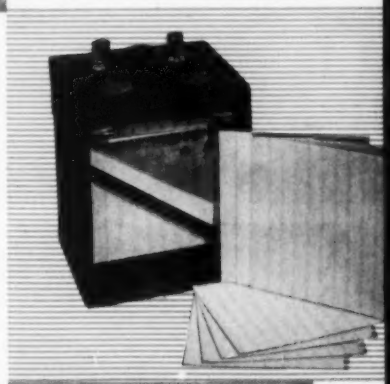


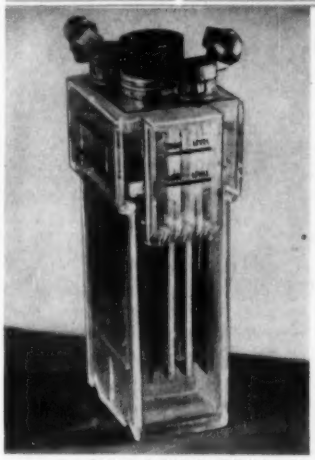
Plastic battery vent plugs are molded in varying functional shapes and sizes

Courtesy Minnesota Plastics Corp.

Fibrous glass separators bonded with phenolic resin can be used in both dry and wet charged storage batteries

Courtesy Owens-Corning Fiberglas Corp.





Courtesy Gould-National Batteries, Inc.

Plastic parts include visual means of indicating sp. gr. of electrolyte

ribbed sheet highly porous. Because of this porosity, the material, when used as a battery plate separator, permits a free flow of electrolyte between the plates. This porosity, coupled with very high electrical resistance, contributes to better high-rate capacity and improved all-around battery performance. This vinyl material is superior in all respects to both rubber and wood in this application. The technical details of compounding, extrusion, and chemical treatment of this material are discussed later in this article.

Polyethylene is proving to be a versatile plastic in battery manufacture. Its most important use thus far is in the replacement of lead alloy as a tube sealer in Exide Ironclad batteries, which have many industrial uses. Here its great resistance to corrosion and oxidation has improved battery performance and increased battery life. Its pliability also makes it highly efficient as vent plug material when its final shape is held by a snap-in disk of styrene. It is being used, too, for separator supports.

Rigid Vinylite, because of its resistance to corrosion, is used in extruded "U" channels for covering the raw edges of steel trays in which Exide Ironclad industrial truck batteries are assembled. Rigid vinyl sheets are also used for name plates on many types of batteries.

Cylindrical acrylic (Lucite) tie rods are being used to hold together the stainless steel or nickel-iron plates at the bottoms of certain battery cells. They are economical to use and have the important properties of lightness, alkaline resistance, and high dielectric strength.

Styrofoam, because of its extreme lightness and its high resistance to uniform pressure over large areas, is used as blocking material in torpedo battery trays.

Electric Storage Battery Co. has engineered more different size batteries in plastics cases than any other company in the field. Accompanying photographs illustrate some of these transparent housings, ranging in weight from 20 oz. up to about 6 pounds. All of these clear styrene housings are annealed after molding to make them as strain-free as possible.

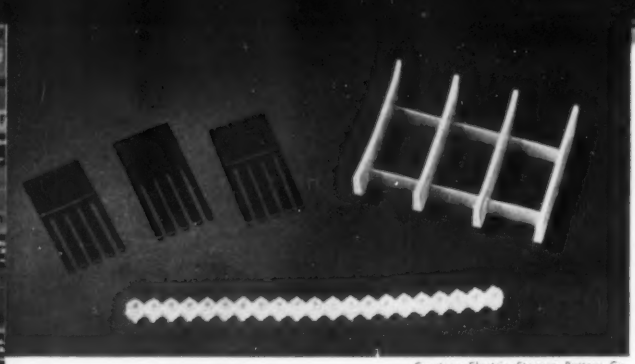
This company has invested hundreds of thousands of dollars in injection molds in order to complete their line. Two of the photographs on page 73 illustrate molding operations. One of them shows a girl just removing a large transparent styrene battery housing from the force plug of the mold, which is mounted in what is probably the world's largest commercially built injection molding machine. This Watson-Stillman machine has a plasticizing capacity of 500 lb. of styrene per hour; a clamp of 1500 tons; platen area measuring 6 ft. wide by 4 ft. high; and a shot capacity of 300 oz. of styrene. Maximum daylight between platens is 108 in. and available stroke is 5 feet. This entire stroke can be traveled by the movable platen in 9 seconds.

Plate Separators

When the dry-charged battery was developed during World War II, it was found impossible to use wooden separators; they warped, cracked, and otherwise became unusable because of changes in atmospheric conditions.

The first practical separator for this type of battery was of fibrous glass bonded with phenolic resin. The first of these separators were quite costly and therefore were used only in batteries for the armed forces where performance and not price was the criterion. Since then, however, a leading manufacturer of this type of separator, Glasfloss Div. Tilo Roofing Co., Hicksville, N.Y., has made improvements in separator manufacturing methods so that it has become economically possible to use them in dry-charged batteries for civilian use.

A few months ago the Firestone Tire and Rubber Co. placed this type of battery on the market specifically for automotive replacement. According to Firestone experts, the new developments which



Courtesy Electric Storage Battery Co.

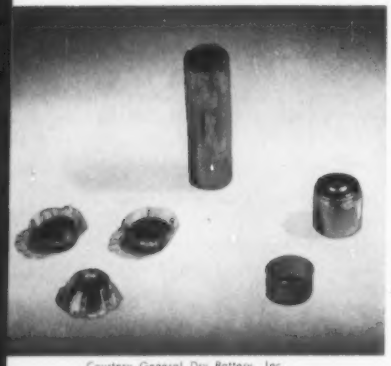
Polyethylene battery components include: tube sealer strip (foreground); separator supports (left); and protectors for separator tops (right)

Courtesy The Firestone Tire & Rubber Co.

Sulphuric acid electrolyte, safely stored and shipped in flexible, unbreakable polyethylene bottles, is used to activate dry charged batteries

Courtesy Gould-National Batteries, Inc.

Markings (top) on redesigned vent plug (bottom) indicate level of electrolyte



Courtesy General Dry Battery, Inc.

Saran film, polyethylene, and styrene parts of a mercury cell dry battery

made this dry-charged battery possible from both mechanical and economical standpoints were the fibrous glass separators and a polyethylene bottle for shipping the battery acid. Savings are made in packing and shipping, and the problem of aging, inherent in the wet-charged type of battery, is eliminated. The new battery sells for only $1.50 more than the wet type but carries a three month longer guarantee. Today the fibrous glass separator is being used not only in the dry-charged type of battery but is also finding wide use in standard wet-charged batteries.

Fibrous glass impregnated with synthetic resin is also used in a combination battery separator and retainer mat. This combination, produced by Owens-Corning Fiberglas Corp., Toledo, Ohio, is reported to be not only more efficient but also more economical than individual separators and retainers. In production, stiff sheets of extruded diatomaceous earth are sandwiched between two layers of Fiberglas mat which has been bonded with either styrene or furfural. No changes in battery design or assembly techniques need be made to use this type of separator.

Porous Vinyl Sheet

A more recent development in battery separators makes use of an extruded porous vinyl sheet. Although vinyl film as such is not porous, a development by Stokes Molded Products Co., Inc., Trenton, N.J., has made it possible to produce vinyl sheet with a porosity satisfactory for battery separator use. Production of the sheet is practically a continuous operation, except that a 24-hr. aging period is required between compounding and the time the material is placed in the hopper of the extruder.

For production of porous vinyl sheet, a special Marvinol formulation is dry-mixed in a predetermined proportion with a colorant—carbon black if grey stock is required—and an inert filler. This mixture is then fed to a series of blenders among which is an Entoleter. When these components have been thoroughly blended in a dry condition they are fed to an internal mixer at which point solvent is added. As the material issues from the mixer in the form of globules it has the consistency of dough. It is then stored and allowed to age, after which it is ground to a powder and fed to the hopper of a Modern Plastic Machinery Co. extruder. There are two straight-line extrusion and treating setups at the Stokes plant, one of which uses a 2½-in. M.P. extruder producing a strip two separators in width and a 4½-in. M.P. extruder which will produce a strip three or four separators wide.

Illustrations included in this article show the setup for the two-separator-wide operation. A ribbed slot die not only forms the plasticized vinyl compound into the ribbed form required but also

scores the center of the sheet so that after the treating operations have been completed the two separators may be easily broken apart.

After the vinyl issues from the die it is fed directly to a solvent recovery oven where the majority of the residual solvent is removed. The strip then passes into a heated bath which serves to swell it in all dimensions. As the strip issued from the recovery oven it passed under a bank of infra-red lamps, the heat from which serves to keep the material pliable. The strip now enters the first of a series of hot acid baths where the inert filler is eaten out, thereby making the sheet porous. The first acid baths are quite hot; the others are progressively cooler. As the sheet issues from the final bath it has shrunk to its original extruded size. This wet sheet passes through a series of drying ovens and is then fed to automatic equipment which cuts whatever lengths are required.

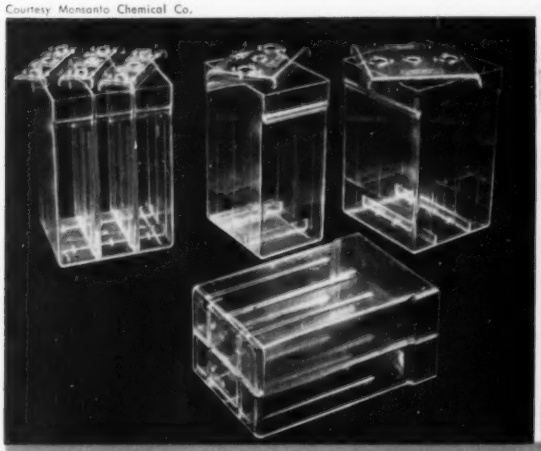
Separators made of this porous vinyl sheet for the general battery trade are known by the trade name Synpor; those used by Electric Storage Battery Co. for several types of batteries are trade named Pormax.

U. S. Rubber Co. has recently developed another new battery separator known as the Rever. It is constructed of a ribbed fiber sheet impregnated with a special plastic, some of the details of which are held confidential. According to U. S. Rubber, the plastic gives this separator excellent dimensional stability and high resistance to oxidation, as well as the proper porosity.

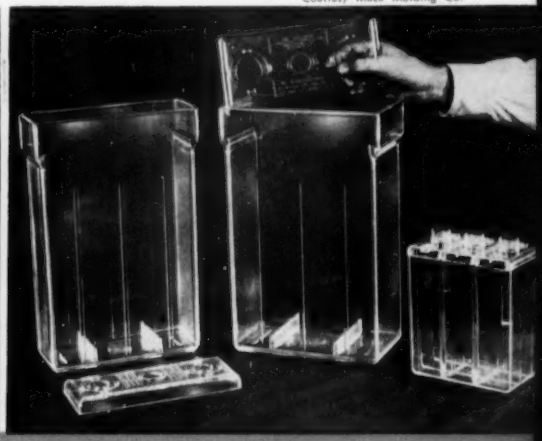
Six Times Lighter

Plastics are being used for housings, housing covers, and separators for the entire line of sensational new alkaline storage batteries manufactured by the Yardney Electric Corp., New York, N.Y. This type of battery, known as the Yardney Silvercel, is claimed to be up to six times lighter and five times smaller than the more familiar

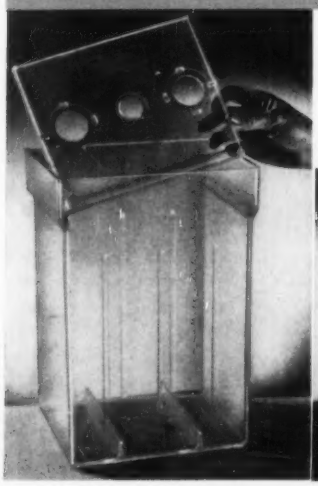
Courtesy Monsanto Chemical Co.



Courtesy Mack Molding Co.



STYRENE REPLACES GLASS IN BATTERY JARS



Wide divergence in shape and size characterizes these styrene battery jars engineered by Electric Storage Battery Co. Jars molded by Pro-phy-lac-tic Brush Co. (left, above) vary in shape from rectangular to square. Typical of the range in size is the small case, shown on the right above, which measures 7 in. high by 6½ in. wide by 4¼ in. deep, as compared to the larger case beside it, which is 14¾ high by 10 by 5 inches. An even larger model—15 by 10⅛ by 8¾ in.—is illustrated to the left below. Approximate wall thickness on most of the jars is ⅛-inch

Both photos courtesy A. L. Hyde

lead-acid, nickel-cadmium, or nickel-iron batteries of the same ampere-hour capacity.

This new battery makes use of silver and zinc as the active materials. The electrolyte is absorbed by this active material, thus eliminating the hazard of spilling if the battery is up-ended. Generally speaking, it is not necessary to add electrolyte during the normal life of this battery. Another outstanding characteristic is the extreme flatness of the voltage curve at all discharge rates. The battery exhibits remarkable resistance to mechanical stresses. Tests during discharge under 10g vibration and 100g shock in various planes showed less than ½% variation in voltage and no loss in capacity. Neither did the plastics housings or covers break or crack. Nineteen models with capacities ranging from ½ to 100 ampere-hours are standard and, of course, special capacities can be produced. Larger capacity batteries are now being tested. At least 10 different sizes of injection molded housings and covers are used for the complete line. The molded cases range from approximately 1¼ to 6⅞ in. high, from 1⅛ to 3½ in. wide, and from ½ to 2¾ in. deep.

The smaller sizes are molded on 6-oz. Improved Paper Co. injection machines; the large ones on 22-oz. machines.

Housings and covers for Yardney Silvercels are molded of Bakelite C-11 styrene, which was specified because of its high resistance to shock and corrosion as well as its excellent electrical characteristics. Because of the extreme dimensional accuracy required in the assembly of the battery components, it was necessary that the interior of the C-11 housings be molded with practically no taper at all. The problems imposed by this dimensional specification were overcome by the molder, Hope Plastics, Providence, R. I. No major problem of machine capacity derating due to the use of C-11 was encountered by the molder.

It is known that plastics are used in the separators of the Silvercel battery but Yardney will not release details other than that the principle of ion exchange is involved and that it has aided greatly in prolonging the life of the batteries.

Because of its small size and weight, this type of battery has found many uses in aircraft and is being widely used in guided missiles.

Gould-National Batteries Inc., Trenton, N.J., has a line of styrene housed batteries for use in telephone installations, alarm systems, power plant control systems, and other applications where batteries are used for stand-by emergency power. Gould is also producing similarly housed batteries for aircraft use and is making use of other plastics in batteries. For example, a phenolic-glass separator is used in submarine or mine locomotive batteries.

Wrapped in Vinyl

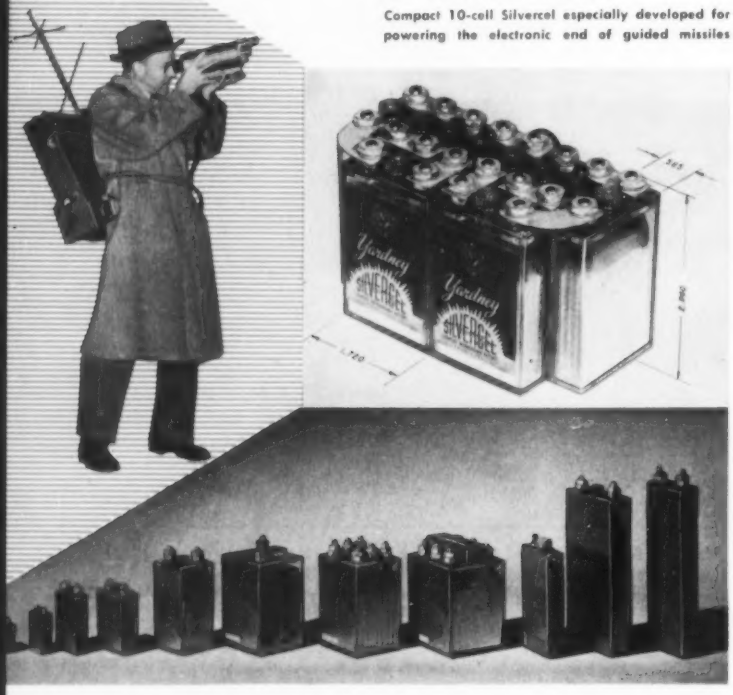
In Gould batteries, each plate pack is wrapped around all four sides with a sheet of perforated polyvinyl chloride sheet stock. The purpose of this "wrap around" is to insure that the glass insulators remain in their proper location. According to Gould, the rubber sheet which was replaced by the polyvinyl chloride tended to become brittle and was subject to attack by a combination of the battery acid and the lead peroxide in the positive plate. No deterioration has been apparent since polyvinyl sheet stock has been used.

An illustration on page 76 shows a cut-away view of a storage battery cell equipped with Gould's newly redesigned vent plug. This plug, named the "Televel," indicates at a glance whether the battery is full, low, or requires water.

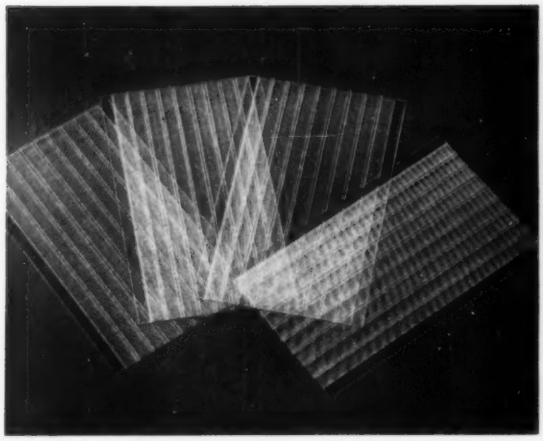
Silvercel battery, using plastics parts, services portable TV transmitter; battery is lighter and smaller than conventional types

Photos courtesy Yardney Electric Corp.

Compact 10-cell Silvercel especially developed for powering the electronic end of guided missiles



Eleven cases in Silvercel line range from 1¼ to 6⅞ in. high, from 1⅛ to 3½ in. wide, and from ½ to 2¾ in. deep; all housings and covers made of styrene copolymer



Courtesy Electric Storage Battery Co.

Sheets made of oriented styrene are used to retain the active material in the battery plates; each of the styrene sections has pierced rectangular slots

Courtesy Owens-Corning Fiberglas Corp.

Cutting separator-retainer made of diatomaceous earth sandwiched between fibrous glass bonded with styrene or furfural

These visual indications of electrolyte level are made possible by a translucent cylindrical element of the plug which projects down into the electrolyte. The lower portion of this element is molded in the form of a prism. When the electrolyte is at the correct level this prism is completely submerged. Light waves traveling down the element are absorbed by the electrolyte and are not reflected. The top of the plug shows a black circle, indicating that no water is required. When the electrolyte level is below the prism element, a white circle appears, showing that water is required. These plugs are molded in two pieces of styrene and assembled and printed by Minnesota Plastics Corp., St. Paul, Minn. This company makes a specialty of molding many different sizes and designs of storage battery plugs.

Explosion Hazard Cut

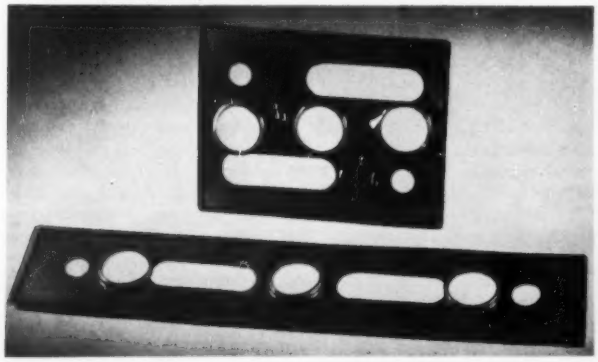
In certain storage battery applications the hazard of explosion of escaping gas during charging is quite pronounced. Gould's latest development for the elimination of this danger is a combination styrene and ceramic vent plug shown in the illustration of the large Gould transparent styrene battery housing on page 79. The highly porous ceramic top and the styrene component are securely bonded together with an adhesive so that the bonded area is leak proof. While the battery is under charge, the evolved gases seep out through the porous ceramic plug cap and are thereby cooled to a temperature below the ignition point. The action is reported to be similar to that in the well-known Davy safety lamp for miners.

Gould-National is the first company to develop and place on the market a styrene housed battery specifically for the automotive replacement field. This battery, with housing and cover molded of a special red styrene alloy by General American Transportation Corp., Chicago, Ill., has fibrous glass sepa-

(Continued on p. 171)

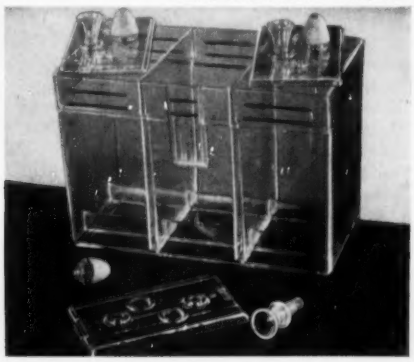
Decorative storage battery tops have a series of ribs molded-in their underside to produce a firm assembly when forced into the soft sealing compound of the cells

Courtesy Minnesota Plastics Corp.



Three-cell battery, housed in styrene, uses combination styrene-ceramic vent plug to reduce explosion hazards

Courtesy Gould-National Batteries, Inc.



Free flowing impact type phenolic molding compound is preformed on automatic machine in production of knife handles

Shallow molds keep mold cost low, are readily interchanged in chase for handling short runs conveniently. Mold is partially loaded; operator holds preforms

Specialization Pays Off

Cutlery industry shown how knife handles, molded of impact phenolics, can cut production costs

BY developing a high speed molding technique geared to the cutlery industry's particular requirements, Adams Plastics Co., Inc., Holyoke, Mass., has not only solved a long-standing problem in cutlery manufacturing, but has also demonstrated that specialization in custom molding can pay steady dividends.

Drawing on wartime experience in making handles for mess kit knives, Adams has shown the industry how impact phenolics can save them money in material and production costs and at the same time provide stronger handles. This molder has demonstrated that handles can be precisely molded to facilitate assembly and thereby eliminate the eight to ten steps required to produce finished handles out of bone. Also it has established the fact that molded plastic handles will stand up to riveting, whereas bone handles shatter in 15% or more cases during this operation.

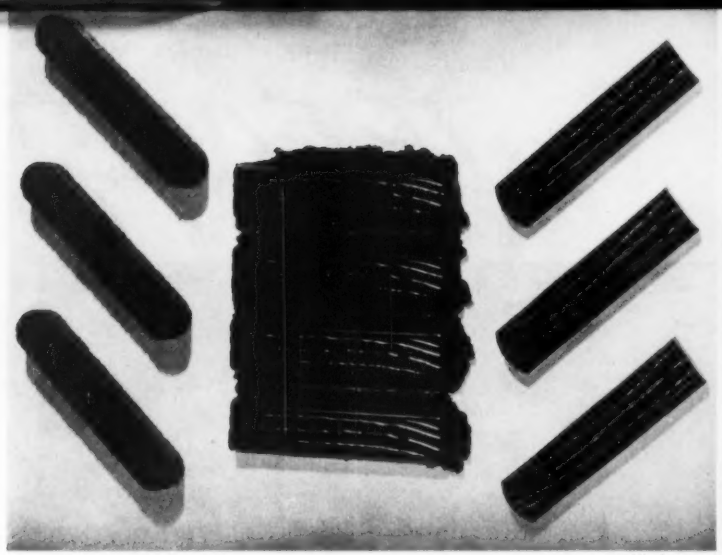
The molding techniques developed by Adams are set up to meet the industry's need for a wide variety of handle designs in quantities ranging from a few hundred sets to extremely long runs. Shallow molds, which may be readily interchanged in the chase, keep mold costs at a minimum. Press room schedules are arranged to meet demands for quick service on short runs of different handle designs. Knockout pins or air blowing techniques can be used for ejecting the molded parts.

Preforms Necessary

Two types of impact phenolics are used. Both were selected because they can be used as preforms, a necessary factor in use of shallow molds and in maintaining high production rates on short or long runs. For handles requiring exceptionally high flexural strength, Adams uses RM 9725 phenolic sheet molding compound, supplied by Rogers Corp., Manchester, Conn. The sheets are cut into preform blanks of the proper size and weight for molding the finished handle. The other type impact phenolic is the RX 400 series bulk molding compounds, also supplied by Rogers. These compounds are readily preformed on automatic tabletting machines.

Adams first used the RM 9725 sheet molding compound in handling wartime contracts for handles for military cutlery. This material's low bulk factor of 1.5:1 recommended it for the shallow, inexpensive molds designed for consumer handles. Other factors that bespoke its continued use was its fast curing and the fact that its thin flash could be removed by tumbling. A manual deflashing operation was not required.

A low bulk factor, ready preformability, fast curing, and easy cut-off are the factors desired and found in the RX materials. Adams is holding preform tolerances consistently to plus or minus 1%. Pourability is another helpful advantage in tabletting, as the material flows freely out of the hopper without agitation. Uniformity of pellet size and preform weight precludes the need of



All photos courtesy Rogers Corp.

Three stages in production of phenolic knife handles. Left to right: preforms (see photo at left on opposite page); molded pieces before removal of flash; finished handles ready for assembly

Thin flash on molded handles is removed by use of a simple tumbling operation

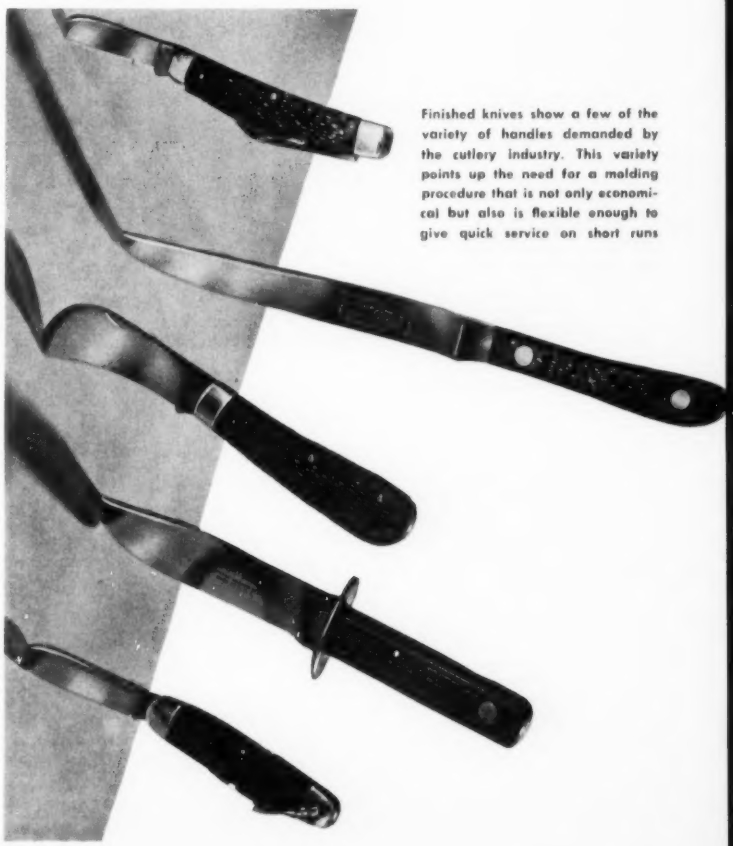
overcharging and thereby results in a thin, easily removed flash.

Another important advantage, particularly in regard to plant housekeeping and personnel relations, is the clean and dustless character of the molding compound. New employees, especially those who have worked previously in molding rooms, are impressed with the lack of dust.

Loading Boards Used

Loading boards are used for the preforms of both the sheet stock and bulk molding compound. This permits the operator to fill the compartments on the loading board while cure is taking place so that almost instantaneous mold loading can be accomplished after the parts have been ejected from the cavities and the excess flash blown away. Because of the relatively fast cure of both materials (approximately 1½ min.), plus the loading board feature, the over-all cycle is only about 2 minutes. The molds are run at temperatures ranging from 300 to 330° F.

By way of dividends reaped through its specialization, Adams is today reported to be supplying 80% of the cutlery industry throughout the world with handles either molded of phenolic or made from Pakkawood, a hard wood veneer impregnated with phenolic resin.



Finished knives show a few of the variety of handles demanded by the cutlery industry. This variety points up the need for a molding procedure that is not only economical but also is flexible enough to give quick service on short runs

JET-AGE

Color engravings courtesy Owens-Corning Fiberglas Corp.

Attractive mottled color effect, available in five different shades, lends eye-appeal to a practical luggage series molded of reinforced plastics

ONE of our oldest industries, luggage, and one of our oldest materials, glass, have met head-on in Chicago, and the new results are wonderful: tougher, lighter, lovelier luggage that's actually easier on the purchaser's budget.

The luggage trade, with its origins buried in antiquity, until recently had resisted modern high production methods and materials, and quite obviously was ripe for a change. Or so it seemed, anyway, to a pair of inquisitive engineers, Mac Belber, scion of an old-line eastern luggage family, and the author. Their firms, Belber Trunk & Bag Co., Philadelphia, Pa., and General American Transportation Corp., Chicago, Ill., agreed that luggage was a logical challenge for reinforced plastics, and they backed their bet with dollars.

There ensued one of those joint industrial research and development ventures that are typical of aggressive American business. Many months and many designs later the results of the Belber-GATX project, molded of Fiberglas-polyester in five new color effects, were unveiled secretly before top U.S. department and chain store luggage men at the Palmer House in Chicago by Jack Brier, president of the Belber firm.

Those several days were a luggage salesman's dream. The show-hardened buyers, usually tough and wary, were visibly enthused and eager to place business. Brier, although then in no position to handle production orders, found himself besieged with retail commitments running to some $5,000,000 . . . provided, of course, his firm cared to produce the new Fiberglas line of luggage.

The decision was swift, and within several weeks GATX, as molder, was authorized to complete designs for the remaining four cases of the introductory line, and had placed production steel mold orders in work. A

* Director, Reinforced Plastics Dept., General American Transportation Corp., Chicago, Ill. Color and black and white photos by the author, except as otherwise noted.

LUGGAGE

How a new line of tougher, lighter luggage was developed through a challenge to reinforced plastics

by Edwin F. Bushman*

new firm, Saberly Products Corp., was formed by Belber Trunk & Bag Co. and associated interests to assemble and merchandise the new line of luggage, bearing the Saberly name. In addition, a new plant was established in Philadelphia and organized along modern production line methods for rapid assembly and shipping of the new Fiberglas-polyester luggage.

Obsoletes Luggage Methods

Manufacturing methods in the new Saberly plant are happily a far cry from older methods of luggage manufacture, because of new design features and molding and coloring techniques developed by the General American research unit.

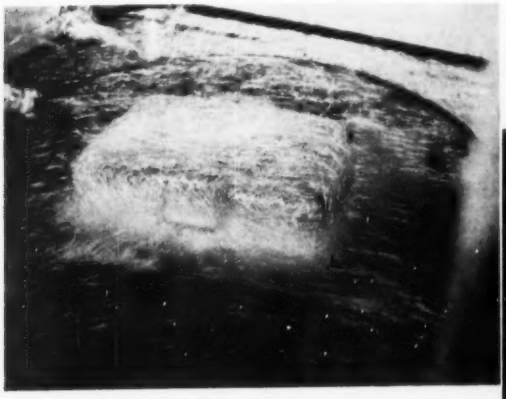
Most quality "hard-side" luggage consists of a lid and a body, each glued, molded, or tacked together from wood veneers, then fitted with dust-stops. A suitable outer covering of leather, sheet vinyl, synthetic rubber, or coated fabric is attached by cementing to the wood. A rubber or vinyl welting is sewed around the outer corners of the boxes to protect the wood joints. Handles, latches, and hinges are attached by riveting. Linings are sewed from fabrics and are cemented to the inner surfaces of the wood box. Final result . . . usually a heavy, squarish-looking case of varying strength, and a factory setup of many large departments, each with its tricky technologies and high-priced labor skills. Inventories of raw materials are large and varied, and have a tendency to burden the luggage manufacturer.

The Saberly plant eliminates many departments and operations, such as the large wood box department with its cutting, wood forming, and gluing operations; the wood humidity control rooms; box storerooms; the sheet leather or plastics goods inventories; the sheet goods cutting room; the sheet goods gluing room; the heavy welting stitching room; and handle and handle attachment inventories. Since the linings are merely snapped into place and may be easily removed for dry cleaning or interchanging, attachment in assembly is simple.

Shorter Term Financing

Saberly is equipped to receive rail car loads and truck shipment of molded case halves from the GATX plant in East Chicago, Ind., and unload directly into their one-floor assembly plant. Attachment hinges, locks, foot lugs and nameplate, and insertion of the linings are the only assembly operations required. No further covering or decoration of the exterior of the case is required, since the final color finish is molded in by the GATX process.

Thus Saberly can turn its inventories promptly, invoicing finished cases to its customers a few days after receipt of molded case halves. There are economies also in plant size and labor rates. Normal luggage plants doing the same dollar volume business as the new Saberly plant range from 1½ to 3 times



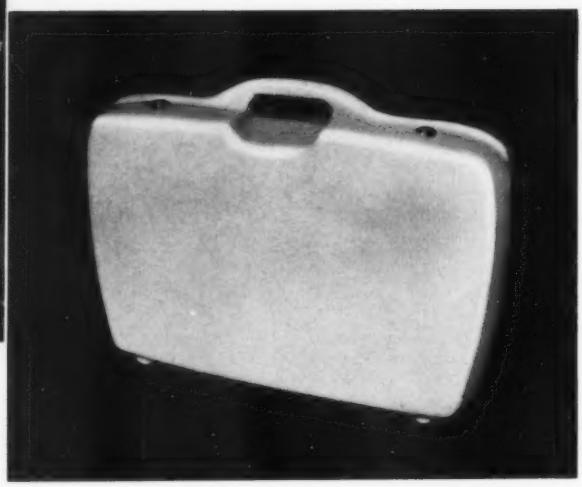
Fibrous glass material is preformed to facilitate the experimental molding of the original 21-in. white luggage piece

Photos courtesy General American Transportation Corp.

Operator pours liquid polyester resin over the preformed fibrous glass that has been laid up on the experimental mold

Photos courtesy General American Transportation Corp.

After molding, finished half of the 21-in. case is removed from the mold and prepared for final assembly



Completed experimental case illustrates radical styling and solid handle construction

larger. Many highly skilled labor operations previously necessary to luggage manufacture are eliminated in the new Saberly plant.

A Shakeup in Luggage?

The luggage trade today does business in the vicinity of $150,000,000 annually, and the "hard" luggage goods are made by a large number of firms. The capital investment now necessary to operation of a small luggage plant is not very great, so many small operators vie for a sizable share of the luggage total. The top firm in the business probably does upwards of $20,000,000 annually.

A sharp swing to molded reinforced plastics luggage could well force out of the business many of the present small operators who would be unable to afford the high minimum cost of steel tooling required to launch a line of reinforced plastics luggage.

While such a trend to fewer operators could develop, the dollar volume of the luggage trade may well increase. Just as the replacement of boat and train travel in large part by auto and plane travel has weaned luggage sales away from wardrobe and steamer trunks to smaller, lighter hand suitcases, continuance of the increased leisure and travel trend should raise the over-all volume of the luggage trade.

Reinforced plastics technology is not as simple as some of the written word in the trade might suggest. The function of a highly skilled custom molder of reinforced plastics in launching a new product for a manufacturer can not be lightly dismissed. Very likely the experienced molder has survived some mighty expensive and hazardous educational projects. A new user of reinforced plastics luggage or other product usually saves considerable money and grief by working with a competent molder as a supplier. Likewise, design and development phases, though somewhat slow and expensive, are invaluable in eliminating design errors or difficulties prior to production tooling phases, where changes are most costly.

Strength vs. Weight

Use of fibrous glass-polyester construction in molding suitcase shells permits achievement of optimum designs, lightest weight, and highest strength constructions. The completely assembled 21-in. suitcase is 1½ to 3 lb. lighter than older conventional cases of the equivalent size. Packing volume has not been sacrificed in any way in designing the cases and, in some instances, has been slightly increased. Reason, of course, for the high strength of the cases is the excellent strength properties of the fibrous glass which reinforces the polyester resin. Weathering, reagent, dirt, and abuse resistance of the molded reinforced plastic is excellent.

With the emphasis on development of reinforced plastics luggage, joint sponsorship of the Belber-GATX project was decided upon. Immediate aim of the project was the development of a 21-in. suitcase design acceptable to the Belber firm, to be followed by a wood mock-up and at least one molded sample case of the approved design. The design was to be such that it could not be copied in plywood case construction, and that it would be economical in price.

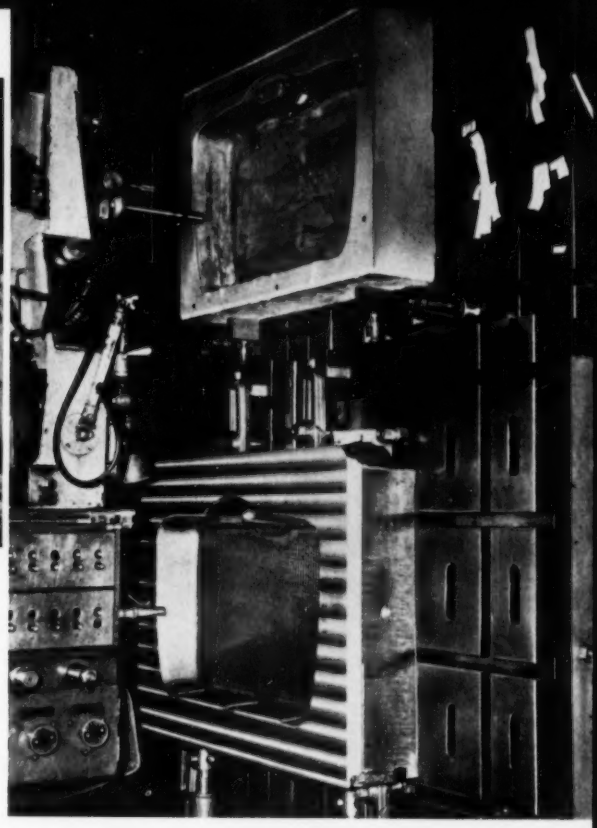
Close customer-molder-stylist teamwork was maintained in the design phase, so that cubical and sales requirements of Mr. Belber were converted to mechanical design units by the writer, and worked out as styling elements by John H. Walter of Grosse Pointe, Mich., General American's stylist on the project. Following some 27 design sketches, the design team evolved a final design acceptable to all. A full-size mahogany mock-up was made and after several further minor revisions, the pattern was approved for experimental molding.

Experimental Tooling

From the final wood pattern, a precision metal mold cavity was made by Accurate Matchplate Co., Chicago, and a mating punch was fashioned by G.A.T.X. The correct part thickness and detail was accurately laid into the cavity using pattern wax sheets. Then an unusual mixture of steel, fibrous glass, and catalyzed, filled polyester resin was poured into the wax-metal cavity. Steam coils and mounting

Courtesy General American Transportation Corp.

Lightweight handle core (center foreground) on the aluminum mold was used to make the solid handle



Courtesy John Reib, Shaw Industries

Steel cavity for production run of 26-in. luggage (top) is machined on Keller from master pattern (bottom)

bolts were cast in place. The unit was allowed to cure at a low temperature, with the cure going to completion in about 8 hours.

Experimental Molding

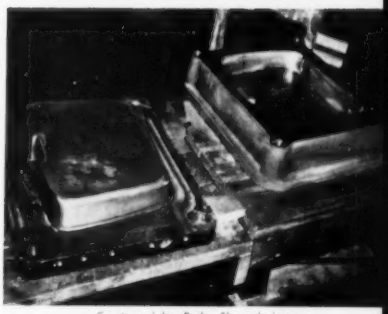
The polished cavity and the punch were mounted in a standard 500-ton compression press in the General American Transportation Corp.'s Plastics Div. plant, and a number of case halves were produced, using preforms and conventional polyester resins, until high quality standards were attained. From these halves, a finished white case was assembled in the Belber plant, successfully terminating the original research contract.

Excellent test buyer reaction to the case sample was received at this point, backed by favorable economics. This led to a second phase of the development work: namely, to produce cases in a new type of color finish. Conventional Fiberglas-polyester solid color treatment was considered unacceptable by the Belber firm. By this time, changes dictated the fabrication of a second mold punch, and this was made in metal to run with the original cavity. A large number of colored case halves were then produced, running the gamut of known color techniques. Finally a novel mottled color technique was developed which satisfied the discerning customer, and mottled cases in blue, green, brown, and red were produced. These were approved, assembled, and privately exhibited by the Belber firm to selected buyers, as outlined earlier.

Final design elements include solid handle construction using modified sandwich core techniques, molded tongue-and-groove closure sections at the center parting line, integrally molded feet, lock retaining ribs, and the novel mottled color effects. All unique design features and molding techniques are the subject of pending patents.

Production

The production steel molds have been prepared by Shaw Industries, Franklin, Pa. Both solid steel and precision cast Meehanite cavities, flame hardened, have been made. Castings were prepared by Johnstone Foundries, Grove City, Pa. Preforming is done in multiples on 48-in. shuttle and manual preform machines, while molding is done on 100-ton HPM presses. No fabrication following molding is required in the GATX plant, other than routine flash removal, before shipment to the Saberly plant.



Courtesy John Reib, Shaw Industries

Cavity and core of finished production mold for the 21-in. luggage case

INJECTION PLANT DESTROYED BY FIRE

All photos courtesy Kusan, Inc.

Destruction of the injection plant of Kusan, Inc., resulted from a ravaging fire that swept uncontrolled through both floors of the building

From the ashes of a fire-destroyed plant come costly lessons on layout, storage, and insurance coverage

by William R. McLain†

LARGELY, we suppose, due to the fact that a new industry builds or acquires relatively new buildings of construction which in themselves do not present a hazard, there have been few disastrous fires in the plastics molding industry . . . which is fortunate.

But this same lack of fires has caused also a lack of experience upon which to base management decision on plant layout, storage, insurance, customer relations, and even public relations.

On the night of July 24, 1952, the modern injection molding plant of Kusan Inc. at Madison, Tenn., was completely destroyed by fire. We learned some expensive lessons, and perhaps information as to what we did learn will be of some service to other molders and their customers.

Cause of the fire remains undetermined, but it is known that it originated in a back room of the upper floor at about 10:30 p.m. There were no operations on this floor at the time since only the basement floor of the building was in use for molding operations. By the time fire fighting equipment had arrived from several nearby stations, the flames had acquired enough headway to prevent any control.

Immediately after the destruction of this plant Kusan began rebuilding at another location and was back in operation with newly acquired equipment in a period of only twenty-three days. Because of warehouse stocks and subcontracted molding with other manufacturers, this was accomplished without interruption of the flow of contract moldings to customers.

Plant Layout

The plant which was involved consisted of a two-story concrete block building having approximately 12,500 sq. ft. of floor space. This area consisted of 5000 sq. ft. on the upper level, and 7500 sq. ft. on the lower level. The floor plan illustrated on p. 88 shows the layout of both these floors. Due to the sloping nature of the land both floors were available to trucks for loading operations. The floor of the lower level was concrete throughout and the upper floor was of three-layer hardwood construction and was supported by steel beams with wooden joists between. The roof was of a composition type supported by wood decking and bow string steel trusses. The area under the roof was not sealed, and the building did not have sprinkler protection.

Material storage and molding departments were located on the lower floor of the building. The front 1500 sq. ft. was used for storage and also for regrinding operations. This area

†President, Kusan, Inc.

was cut off from the center 3500 sq. ft. by an 8-in. concrete block wall with an access opening approximately 8 ft. wide by 10 ft. high, which was the ceiling height. No door was installed at this opening. Stairs from the upper floor, running parallel to the dividing wall, terminated at this opening. The press room, incorporating all molding activities, was located in the 3500-sq. ft. center section. Another block wall at the back of this center section separated it from the rear 2500-sq. ft. shipping platform. There was a 10- by 10-ft. opening between these sections which utilized two wooden doors for closing off the rear section.

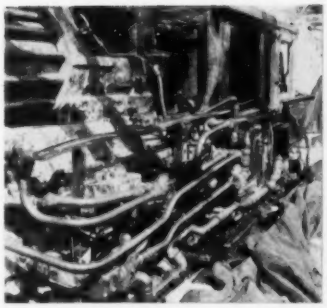
The upper floor had a front area of approximately 1000 sq. ft., which was divided into office, rest rooms, and entrance hall. These lay directly above the material storage area of the lower level. The remainder of the upper floor was undivided with the exception of a small room in the rear corner. This room was approximately 10 by 20 ft. and had two openings of standard single door size. No doors were installed, however. This room was lined in transite and the floor covered with metal. The lighting was explosion proof. These precautions were not installed by Kusan, nor was the room used for hazardous storage. This was, however, the room in which the fire originated.

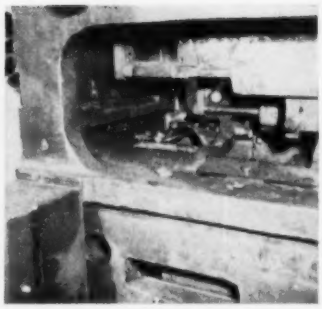
Gas Unit Heaters

The entire building was wired in conduit, and was heated by gas unit heaters. There were closely spaced windows on both of the longitudinal walls on each floor. There was a covered balcony approximately 10 ft. wide and 60 ft. long along one side of the building and this provided the upper level shipping space. This was not enclosed except for canvas drops used in inclement weather.

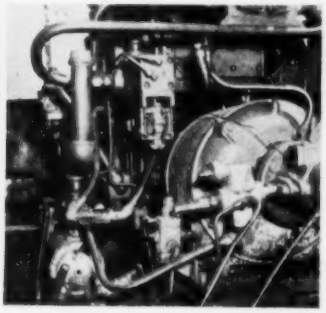
This building was completely destroyed by the fire and the walls collapsed throughout the entire upper level. The steel girders, under intense heat, distorted and dropped into the lower level. It was an extremely hot fire, and the progress was too rapid to arrest its destruction. In order that the effects can be more closely considered, the damage to materials, machinery, and dies will be considered separately.

There was a sizable storage of cor-

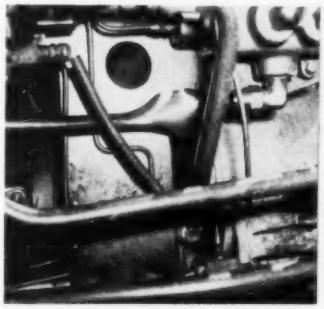


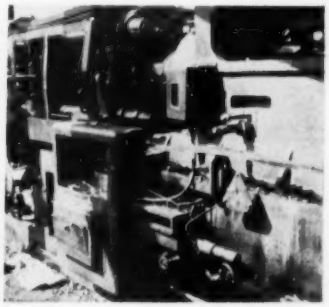


Damage to main body of injection machine end was minor . . . but feed chutes melted completely

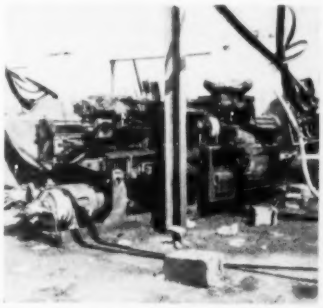


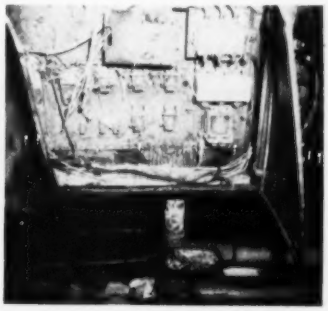
. . . Granular plastic material was uninjured under surface . . . Some pipe ends brazed together



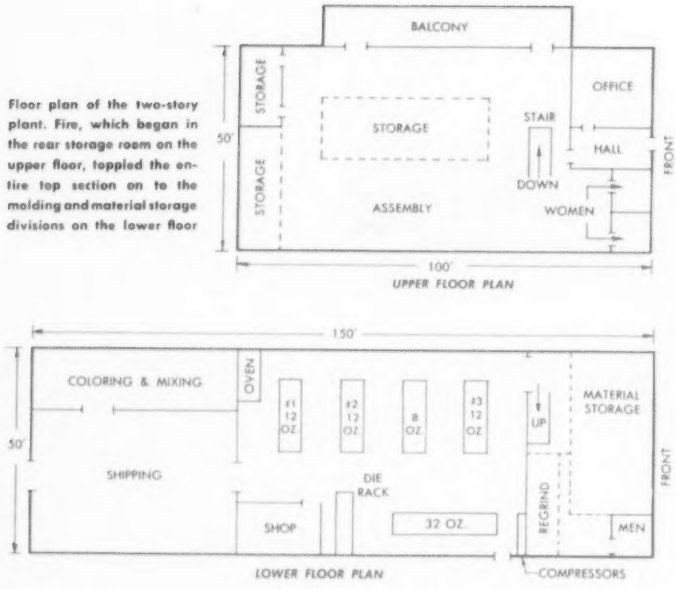


. . . other pipes burst under the heat . . . and the smaller angles and channels were distorted





. . . Falling girders bent only light machine braces . . . but fire completely gutted all control panels



Floor plan of the two-story plant. Fire, which began in the rear storage room on the upper floor, toppled the entire top section on to the molding and material storage divisions on the lower floor

rugated and chipboard containers on the upper floor which contributed a great deal to the intensity of the blaze. In addition to this, there was a small storage of cellophane bags, doll wigs, and rubber bands in the room where the fire originated. Most of the finished molded goods were on the lower rear platform of the building with a small stock located on the upper floor. Remainder of the materials stored in the plant consisted of the usual small packing supplies, office forms, and minor subassembly components.

Materials Damage

With the exception of a small amount of material in the molding room and the drying oven, all plastic materials in a virgin and reground state were located in the front section of the lower level. There were approximately 80,000 lb. of materials in the plant at the time of the fire. Of this total, some 10,000 lb. was cellulose acetate, 5,000 lb. was cellulose acetate butyrate, and the remainder was about equally divided between high impact and regular polystyrene material in both clear and a wide range of colors. This material was stored in bags and drums. The 50-lb. bags, which were all filled with one of the types of polystyrene material, were stacked in compact islands to a height of about eight feet. Drums were stacked two high and three high in various rows according to type and color.

The course of the fire seemed to run the length of the upper floor consuming the dry wood flooring which then fell to the lower level. All of the blazing contents of the office fell into the material storage and set this on fire. From all later observation this sector did not burn any more violently nor any hotter than other sections of the building. Because of the close packed nature of the materials, it is believed that the combustion actually proceeded at a slower rate. The solidity of the stacked materials also caused the fire in this area to flare up again a number of times after it was supposedly extinguished. These recurrences were of the nature of a quiet burning flame however and not a violent blazing.

Surface Burning

Inspection of the material storage after the fire showed that the plastic had burned on the surface only and had formed a molten burning pool over the entire mass. After the fire, large sections of the melted covering could be removed intact. Examination of these sections showed approximately $\frac{3}{8}$ in. of charred mass on the upper surface and about 2 in. of progressively looser caking below this. Underneath this section the material was uninjured, and was loose and granular. There was little evidence of water damage to these materials, although some were damp when removed. The only necessary precaution in removal of the material for salvaging was to attempt to keep all ash particles out of the clean material.

Approximately 20,000 lb. of undamaged material was removed from the debris and in a few cases entire drums and bags were removed undamaged. The reclaimed materials included not only colored but clear plastic, and incorporated all of the various types of plastics in the storage. In other instances where there were partial drums of material of compactly packed parts in the molding room the same types of results were evident. Similar burning, caused by a lack of air due to compact storage, existed in the case of some of the chipboard box storage.

The conclusions made on the basis of this experience were that the plastic materials involved made no unusual contribution to the fire, that they were of a combustibility similar to that of wood or closely packed cardboard, and that salvage value of materials would be a matter of chance depending entirely upon the nature and extent of the fire as well as storage conditions.

Machinery Damage

One of the matters of major importance in any such occurrence is the amount of damage to the production equipment. In an injection molding plant this subject is of vital concern due to the high cost of the intricate machinery involved. For this reason it is felt that a detailed report as to the extent of damages will be worthwhile.

In the Madison plant there were five Reed-Prentice injection molding machines. There were three 10D-12-oz. machines, one 10D-8-oz. machine, and one 10E-32-oz. machine. These were installed in the center room of the lower floor of the building. Four of the machines were placed in a row parallel to each other and to the end walls of the press room; the 32-oz. press was

(*Continued on p. 172*)

Spirally Spun Polyethylene

Ladies handbags are woven of thread wrapped in polyethylene monofilament

Monofilament is spirally spun around a three-stranded rayon or cotton core

SMART-looking ladies accessories set the background for the entry of polyethylene monofilament into the world of fashion. The monofilament is spirally formed around a rayon or cotton core to produce an attractive thread that is woven by fabricators into fashionable handbags, costume jewelry, and trinkets.

Because of the spiral windings of the monofilament, the thread closely resembles strung beads and the finished woven product has all the eye appeal of the popular beaded accessories—with none of the disadvantages of beads. The polyethylene thread is produced in several colors —white, tan, red, green, yellow, blue, or pink—which can be combined into attractive patterns. When worn as jewelry or carried as a handbag, the smooth surface of the monofilament has a pleasant feel. The accessories will withstand hard wear and are easily cleaned.

Multi-Text Products Co., Newark, N. J., both extrudes the colored, unoriented monofilament and spins it spirally around the rayon or cotton core. The actual spinning into thread is a precise and carefully controlled operation using specially built equipment. Since the polyethylene is unoriented, delicate tension adjustment is necessary in handling to prevent stretching.

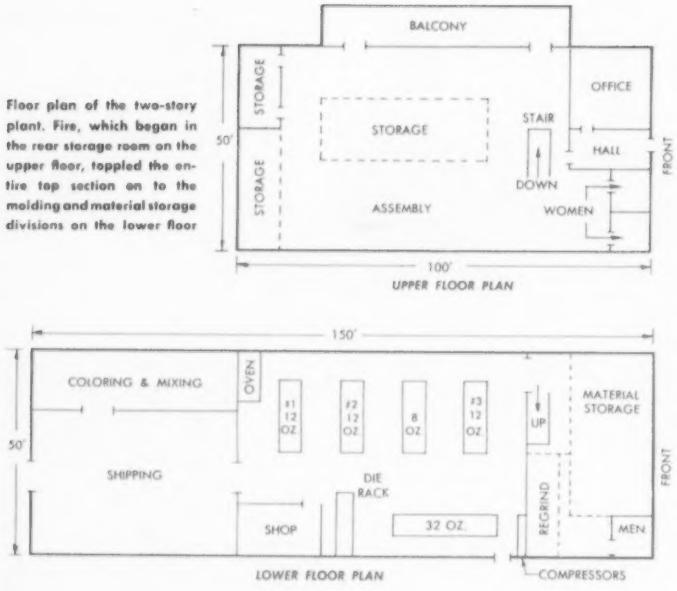
From 18 to 28 monofilaments are extruded at one time and drawn to a diameter of either 0.024 or 0.035 inch. As the filaments emerge from the extruder, each is run through a cooling water bath and then wound onto a spool that holds approximately $\frac{3}{4}$ lb. of the material.

The full spool, together with spools of the core material, then goes to a spinning machine. Usually 3 strands of rayon or cotton are used as the core, but the number can be increased when additional thickness is required. The degree of tightness with which the filament is spiralled around the core is controlled by adjusting the spinning and the draw-off speeds.

By using a temperature control process, the spiralled polyethylene is set in place so that it does not tend to unwind.

Among those making use of the thread are Garay & Co., Inc., New York, N.Y., manufacturers of the "Snow Bead" handbags, and Terin Novelty Co., New York, N.Y.

Necklace of polyethylene-wrapped threads resembles strung beads



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Monofilament is spirally spun around a three-stranded rayon or cotton core

Necklace of polyethylene-wrapped threads resembles strung beads

SMART-looking ladies accessories set the background for the entry of polyethylene monofilament into the world of fashion. The monofilament is spirally formed around a rayon or cotton core to produce an attractive thread that is woven by fabricators into fashionable handbags, costume jewelry, and trinkets.

Because of the spiral windings of the monofilament, the thread closely resembles strung beads and the finished woven product has all the eye appeal of the popular beaded accessories—with none of the disadvantages of beads. The polyethylene thread is produced in several colors —white, tan, red, green, yellow, blue, or pink—which can be combined into attractive patterns. When worn as jewelry or carried as a handbag, the smooth surface of the monofilament has a pleasant feel. The accessories will withstand hard wear and are easily cleaned.

Multi-Text Products Co., Newark, N. J., both extrudes the colored, unoriented monofilament and spins it spirally around the rayon or cotton core. The actual spinning into thread is a precise and carefully controlled operation using specially built equipment. Since the polyethylene is unoriented, delicate tension adjustment is necessary in handling to prevent stretching.

From 18 to 28 monofilaments are extruded at one time and drawn to a diameter of either 0.024 or 0.035 inch. As the filaments emerge from the extruder, each is run through a cooling water bath and then wound onto a spool that holds approximately $\frac{3}{4}$ lb. of the material.

The full spool, together with spools of the core material, then goes to a spinning machine. Usually 3 strands of rayon or cotton are used as the core, but the number can be increased when additional thickness is required. The degree of tightness with which the filament is spiralled around the core is controlled by adjusting the spinning and the draw-off speeds.

By using a temperature control process, the spiralled polyethylene is set in place so that it does not tend to unwind.

Among those making use of the thread are Garay & Co., Inc., New York, N.Y., manufacturers of the "Snow Bead" handbags, and Terin Novelty Co., New York, N.Y.

To highlight details of musculature, artist uses spray gun to apply paints over basic muscle coloring of the molded torso

Photos this page courtesy Watson-Standard Co.

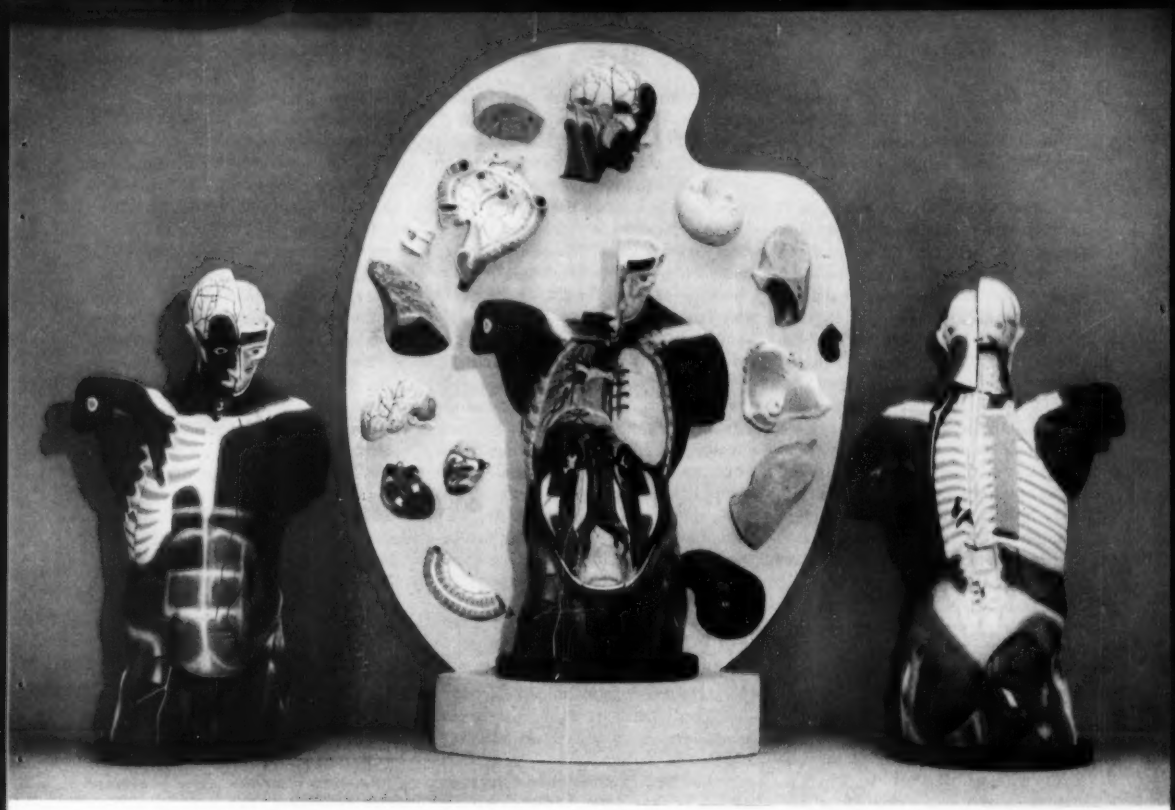
After fusion and curing under carefully controlled temperatures, the torso model is removed from the mold and the flash is trimmed by hand

Spray masks fabricated of fibrous glass-polyester laminate are laid on model

Indestructible

WITH the development of vinyl plastisol anatomical models which faithfully duplicate the texture and "feel" as well as the appearance of actual tissues, organs, and other parts of the human body, the Histoslide Co., Chicago, Ill., has made a major contribution to instruction techniques in the teaching profession. Startling in their realism and virtually indestructible in normal use, these plastics models mark the culmination of more than two years of experimental work by Histoslide in cooperation with Watson-Standard Co., Pittsburgh, Pa., which supplies the specially compounded plastisols used in their preparation.

It is believed that these models, some of which contain as much as 35 lb. of the vinyl material, are the largest and heaviest products which have been made of plastisols up to the present time. Although they are a logical extension of the work being done with plastisols in the production of smaller products such as doll parts, hand puppets, and infant toys, the complexity and size of the Histoslide models presented many new problems. One of the most difficult was the necessity of developing a special plastisol compound which would have great strength and rigidity after curing, yet would be sufficiently fluid in the uncured state to fill out even the most intricate details of the molds. Watson-Standard met this exacting requirement with compounds having a resin-to-plasti-



Color photos and engravings courtesy Bakelite Co.

Torso model, molded of vinyl plastisol, dramatizes authentic realism; removable plastisol organs (center) duplicate textures of human counterparts

Anatomical Models

cizer ratio of approximately 1 to 0.3, whereas the ratio in most plastisols is about 1 to 1.

Production Economy

Apart from their significance as a production achievement, pointing to previously unexplored possibilities with plastisols, these anatomical models are vastly superior to the conventional composition type long standard in this field. Unaffected by climate, they also possess life-like flexibility and unprecedented durability; in addition, they have the advantage of economy. Through the development of adequate production facilities, the models are sold at a price competitive to plaster models. Their basic colors are pigmented in the resins, assuring life-long color fastness. Artwork, hand applied by highly skilled artists, indicates the location of veins, arteries, and other parts of the anatomy. Decorative lacquers used for this purpose are of the air dry, vinyl resin type, specially formulated by Watson-Standard to form a permanent bond with the plastic sub-structure. Thus it is impossible to chip, tear, scratch, or otherwise mar the surface of Histoslide's new "Life-Like" plastic models with any blunt instrument, and repeated washings with strong soap solutions will not fade or remove the paint pigments.

The three-dimensional biological models were designed to afford students a more accurate reproduction of nature. Through a process of pressure molding in metal molds, it is possible to attain consistent reproduction of the most intricate structures and flawless details. Removal of the parts from undercut sections in the molds is facilitated by the flexibility of the vinyl plastisol.

Physical Details

One of the most noteworthy aspects of the models is the variation of physical properties according to the organ or structure represented. For example, in the "muscle man" torso, illustrated in full color on this page, organs such as the lungs, stomach, and brain feel much like the corresponding human organs. Techniques perfected by Histoslide

in cooperation with Watson-Standard make it possible to combine different degrees of hardness in one part. This is accomplished by blending plastisols with different molecular weights into one structure, through the use of overlays and controlled fusion. Some idea of the amount of plastisol material involved in these models may be gained from the fact that the torso figure illustrated, scaled to the size of a 6 ft. man, contains about 25 lb. of material, exclusive of that making up the 26 removable plastisol organs.

Complete dissection of the muscle man model permits a clear vision of organs and structures never before demonstrated by an American-made model. From the instruction standpoint, an important feature is the fact that the basic model can be purchased with interchangeable male and female pelvic organs, permitting the complete human anatomy to be taught with one basic model.

Interchangeability of parts is another advantage of the Histoslide "Life-Like" models. If a school's budget will not enable it to purchase the complete torso, a start may be made with the basic unit, which is similar except that a few structures are deleted to simplify its scope of use and permit periodical purchase of additions. Since the plastics sections are accurately made in metal molds, separate parts can be ordered by number and will fit any basic unit.

Other large models in Histoslide's "Life-Like" plastisol series include a full-length human figure with all systems, including the musculature, in one dissectable model. Thanks to the use of the Watson-Standard plastisols, this model, standing 44 in. high, is sufficiently sturdy for daily student use. Representative of additional human models made by the same process are the brain in cranial cavity, human eye, skin cross sections, heart, respiratory organs, digestive system, ear, kidney, and teeth, etc. The same type plastisol materials are also employed in the production of zoological and botanical models, such as frogs, crayfish, grasshoppers, leaf cellular structures, and flower models. Several of the larger models have removable parts for detailed study.

No Breakage

A major advantage of the plastisol models over those made of other materials, such as rubber and plaster composition, is their resistance to breakage and oxidative decay. Histoslide has in the past done some work with rubber models, but has now converted to the superior vinyl materials. Variations of temperature and humidity cause no unfavorable reaction in the plastic resins used in the plastisol models and breakage presents no problem, even if a large section of the model is dropped or subjected to abuse.

The plastisol compounds supplied by Watson-Standard for this work were specially tailored to meet Histoslide's unique requirements. Essentially, they consist of vinyl Rigidsol, regular vinyl plastisol, and vinyl Foamosol. Of these, the former is the most outstanding in this application. This formulation is interesting in that although it has a low plasticizer content, its viscosity characteristics permit it to be readily injected into the mold under low pressure. The rigidity of the fused part makes even relatively thin wall sections self-supporting.

This compound has a durometer Shore "A" scale hardness of 85 to 90, yet retains enough flexibility to be non-breakable. Another notable characteristic is the fact that the hot tear strength of this compound permits it to be removed from the mold while still relatively hot. By utilizing this material in making the main portion of the model—the torso—little or no use of reinforcing members is required.

Pigmented vinyl plastisols are used in molding the internal organs. These materials have a durometer hardness of 55 to 60 on a Shore "A" scale. The intricate and varied shapes of the internal organs can be reproduced in the minute required

Mounting models on turntable so that units are painted in sequence permits artist to compare each for uniformity of finish

Photos both pages courtesy Watson-Standard Co.

Torso figure is scaled to size of a 6-ft. man and, exclusive of removable organs, contains about 25 lb. of vinyl plastisol

detail, since the low viscosity of the liquid plastisols will search out the details of the mold surface. After fusion, the resultant elastomeric compound may be easily removed from the mold. The film strength of the vinyl plastisol lends durability so that handling may be accomplished wihout fear of destruction, while the texture of the material closely approximates that of the actual organs.

Foaming Agent

In some cases, vinyl Foamosol is used in conjunction with vinyl plastisol. This is a plastisol type compound in which a blowing or foaming agent has been incorporated. Like regular plastisol, it is liquid in nature, and has the special property of foaming or blowing upon application of heat (approximately 350° F.), expanding without internal pressure.

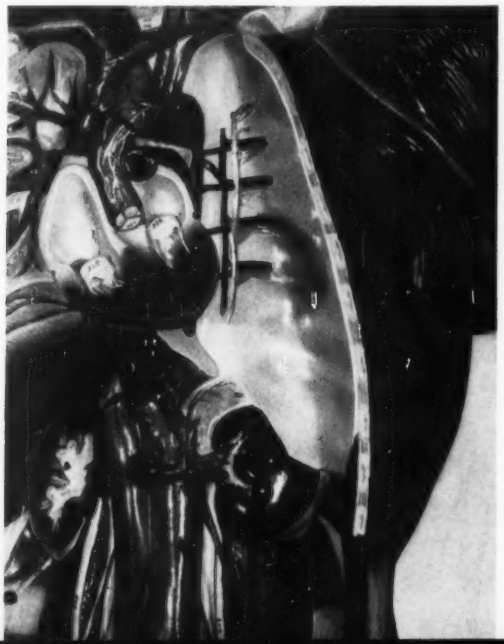
First step in the preparation of the Histoslide models involves the sculpturing of a full-size model in wood or plaster. This work is performed under the direction of Dr. James B. McCormick, medical associate of Histoslide, who supervises initial layout and drafting as well as all technical points pertaining to sculpturing and painting. All sculpturing is based on actual casts of human organs. After completion of the original sculpturing, the model is turned over to M. K. Tobon of the mold and production department for negative reproduction, where all details are faithfully reproduced in aluminum molds.

Molding procedure used by Histoslide consists essentially of applying the plastisol materials under low pressure to the mold cavity, where they are allowed to gel in a relatively low heat range—approximately 150° F. At this point, overlays can be built up where indicated to bring out differential texture. The mold temperature is then elevated to approximately 350° F. to effect cure and fusion. Adequate temperature control is necessary to prevent overcure and charring. Such controls involve the use of a recording pyrometer. Fused pieces are removed from the mold and the flash is trimmed by hand.

Production samples are next submitted to the art department, where the staff of skilled artists applies the final details in color and codes the models by number. In air brushing sections of the large torso model to bring out details of the musculature more clearly, spray masks made by laying up pieces of glass cloth directly on a model and impregnating it with Laminac polyester resin are employed. When coloring and coding are completed, finished production samples are passed on for editing and physical property approval. Only after final inspection and approval is the model released.

Manufacture of the plastic biological models is handled, insofar as possible, on a mass production basis. For example, in the painting and finishing of heads, organs, etc., which require considerable art work, the parts are mounted on a large turntable which is slowly rotated to the next part as each unit is completed. This method not only allows time for drying of the vinyl based paints, but also permits a direct comparison from one to another so that finishing and coding may be kept uniform.

Dr. McCormick and Mr. Tobon believe that the Histoslide program has opened up new vistas of application for plastisols in the production of many types of displays, figure dummies, and other products. Size, for example, is no longer regarded as a serious obstacle, and they project that it will not be long before plastisol products 10 ft. or more in size may be produced without difficulty.



Close-up of torso (left) shows close attention to details and coding; other plastisol models include 44-in. full length figure (right)

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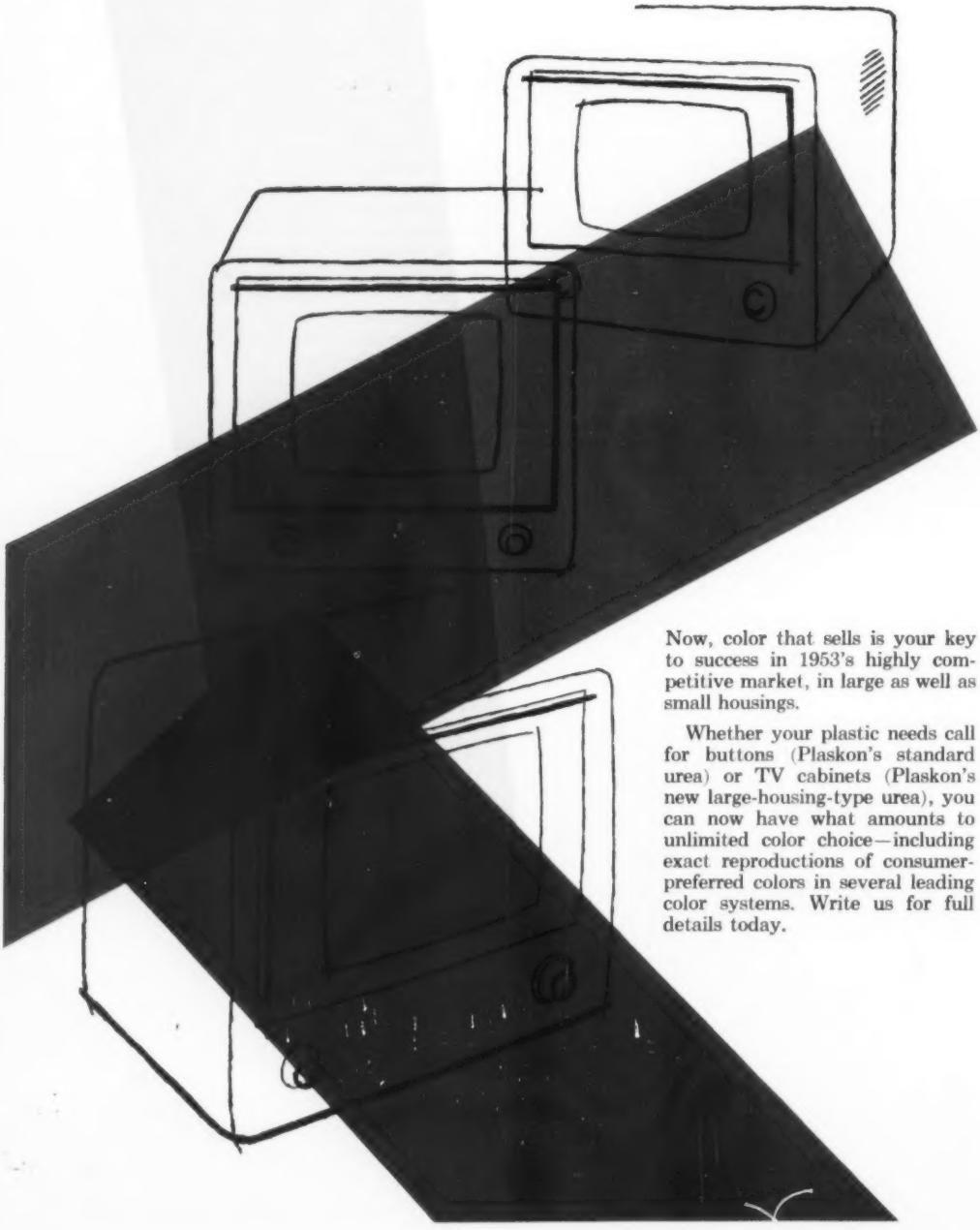

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Housings made of Plaskon's new type of urea are rich in sales appeal: fine detail reproduction, pleasing feel, jewel-like color tone, deep luster, permanent molded-in color.

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Your housings will offer something very special in the way of color and added sales appeal. In the first place, this new type of Plaskon urea bounces light from its hard outer skin and refracts it from the translucent depths below the outer surface. Thus your housings offer an appearance of richness, of solid quality.

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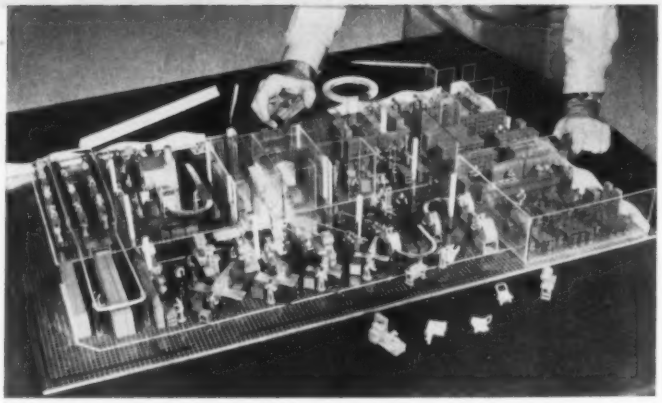
Realistic miniature machinery models, which are to be used in the three-dimensional visual planning of factory layouts, are carefully fabricated of acrylic. Every detail of the original units is reproduced in scale on the models

Planning With Plastics

All photos courtesy Visual Planning Equipment Co., Inc.



Planner tests possible layout arrangements by positioning models on scaled acrylic grid sheet. When final layout is determined, pieces are cemented in position

IN THE complex planning and organization of modern-day industry, the old adage that "one picture is worth a thousand words" is gradually being superseded by the axiom that "one realistic three-dimensional visual presentation is worth a thousand pictures."

Typical of the manner in which three-dimensional presentation has been developed into a workable tool for industry is a new system devised to simplify one of the largest and most involved of industrial undertakings—planning the floor layout for factories, shops, or offices. The system, created by Visual Planning Equipment Co., Inc., Oakmont, Pa., is designed to overcome many of the basic objections to other layout methods. The inaccuracy of paper cut-outs and the time-consuming and laborious job of drafting blueprints have been eliminated.

By using three-dimensional acrylic scale models in building up a complete miniature replica of a plant, the system focuses the attention of the planning group on one physical presentation rather than on many complicated and involved steps. And by utilizing a special photographic setup, the system permits the inexpensive, quick reproduction of a large number of blueprints directly from the finished layout.

Acrylic Models

"Visual Planning" depends to a great extent for its effectiveness on the use of plastics. The bulk of the equipment used is fabricated of Lucite. This includes exactly detailed scale models of standard machines and equipment, some 6000 of which are stocked by the company; permanent plant structural units such as walls, columns, and staircases; and a large gridded planning board.

Acrylic was chosen primarily for its easy machinability—and the consequent speed-up in production—and its excellent optical clarity. To the layout planner, transparency is especially important, particularly in building up a multiple-story structure. In this build-up stage, the acrylic planning board, hand engraved in a scaled grid, represents the entire floor space available for layout. Models of equipment, walls, columns, pipes, etc., are taped in place to the board in the exact position they would occupy in the actual plant. By treating each succeed-

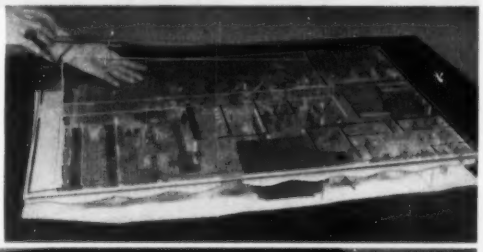
ing floor in a similar fashion, the planner can see through the acrylic planning boards and determine the location of those pieces of equipment on the floor below that might affect his decisions.

Photo Reproduction

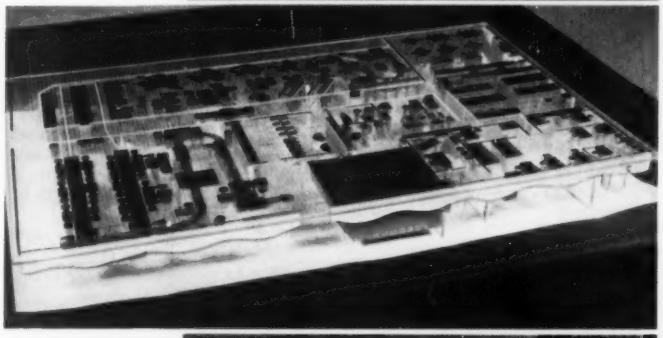
For the successful operation of the photographic stage of "Visual Planning," a minimum of distortion in both the Lucite planning board and a 0.0075-in. acetate film grid sheet is essential. The setup for photography begins as soon as the three-dimensional layout has been completed. The layout is inverted so as to rest on the column structure of the model building. The acetate sheet, printed with a scaled grid similar to that on the planning board, is then laid over the bottom surface of the board. Since both board and sheet are transparent, the base outline of each of the inverted models is visible. "Reprotemplets," which are black film sheets shaped to correspond to the base outlines of every model in the layout, are then taped onto the acetate sheet to match the location of each piece. When all the templets are in place, the acetate sheet is removed and serves as a master photographic negative which can be processed through any Ozalid or blueprint machine to secure as many direct prints of the layout as might be desired.

The decision to use acetate for the film sheets was based by the manufacturer not only on the material's transparency but also on its dimensional stability. Since the film sheet is a negative for the final blueprint, it was important that the scale markings and the position of the templets on the sheet retain their exact details and dimensions. The acetate sheet is, at the same time, flexible enough to be run through any blueprint machine. Marks with either pen, pencil, or crayon can be made on the glossy surface of the acetate and later erased.

Three-dimensional floor layouts for factories, offices, etc., are made with acrylic models; blueprints of finished plan may be made as needed



Completed three-dimensional layout is inverted so as to rest on its column structure; a transparent acetate film sheet is then laid over the base of the acrylic grid



Specially shaped film outlines are taped to the acetate sheet to cover the corresponding exposed base of each model

When all film outlines are in place, the acetate sheet is removed and processed through any blueprint machine to secure final layout prints

Formal Presentation

Besides serving as a tool to help visualize a plant layout installation, the planning system is suitable for use as a permanent plant layout control board. The Lucite models will stand up well under frequent handling over a period of years. They can be pasted to the layout board, removed months later, and reshuffled without any damage.

The three-dimensional layout is equally suited for formal presentation to various levels of management involved in the project. It is attractive and realistic. Each of the Lucite models is a faithful reproduction—in all details—of the original and each is painted differently in accordance with the function of the piece of plant equipment it represents. Blue indicates machine tools and production elements; green represents incidental shop equipment; gray stands for static material-handling equipment; and so on. For a more thorough and dramatic presentation, models of people are available.

By using formal presentation during the course of planning, a wasteful duplication of efforts and the necessity for continued explanations between the many groups, departments, and individuals that have an interest in the undertaking are reduced. To these people—whether technical or non-technical—the blue print has finally come to life.

PLASTICS

Colorful and realistically designed racing sloop, complete with deck accessories, is molded of Dow's Styron 475 styrene. Impervious to rust, the surface will not chip or peel, and the boat is sturdily constructed to withstand the abuse given a toy of this type. Over-all height is 33 in., length is 20 inches. Manufactured by Thomas Mfg. Corp., 80 Clinton St., Newark 5, N. J.

Detailed molding and close finishing are used to produce a realistic Tenite I cellulose acetate model of a Boxer dog. The sturdy 8½ in. high animal, which serves as a decorative piece for table top or mantelpiece, is injection molded in two separate halves on a 16-oz. machine. The halves are then cemented together, flash is carefully removed, and the finished dog is hand painted with the natural fawn coloring of a Boxer. A leather collar around the dog's neck adds to the sense of realism. It is manufactured by Breyer Molding Co., 2536 W. Lake St., Chicago 12.

Toggle fuse puller of Tenite II cellulose acetate butyrate is designed as a practical safety device for removing or replacing fuses. The new puller has double the strength of fiber fuse pullers and can withstand over 4000 volts breakdown after 24 hr. immersion in salt water. Molded by Popular Plastic Products Corp., 256 Main St., Northport, L. I., N. Y. for Star Fuse Co., Inc., 235 Canal St., New York 13, N. Y.

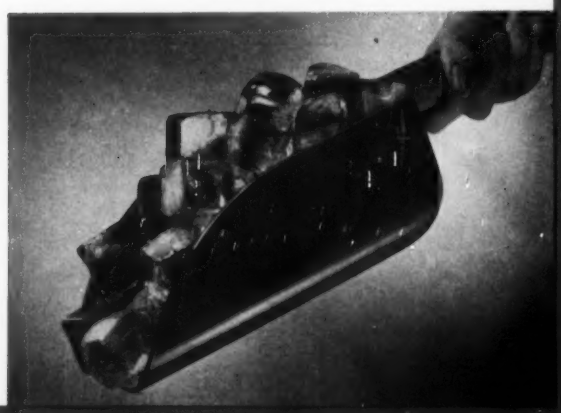
Durable three-piece pet feeder molded of styrene is suitable for use by dogs, cats, and other pets. The feeder consists of two deep white bowls that fit securely into the smooth red stand. The bowls, one of which is intended for water and the other for food, can easily be removed. Both the bowls and the stand itself are completely washable in soap and water. Cut-outs on all four sides of the stand facilitate handling; rubber feet set into each of the legs help to keep the stand firmly in place while it is being used. The feeder, 12 in. long and 6¼ in. wide, is a product of Bernard Edward Co., 5252 S. Kolmar Ave., Chicago 32, Ill.

PRODUCTS

Eye-appealing coasters and cuffs that protect hands and furniture from both hot and cold drinks are injection molded of flexible Bakelite polyethylene. The adjustable cuffs, which wrap around the glass, are held in place by a small molded-in projection at one end of the cuff which inserts into one of three holes die-cut into the opposite end. The matching coasters are molded with a central depression that prevents the glass from slipping. Both are impervious to alcohol or acid stains. Made by All-Power Mfg. Co., 400 Roosevelt Ave., Montebello, Calif.

Molding all the parts of a flour sifter, including the screen, of Dow's high-impact styrene eliminates the possibility of metal parts becoming rusty or of clogged and unsanitary cracks and crevices. Pressing a button at the side of the handle operates the sifter. Distributed in two-tone color combination by Maynard Mfg. Co., 1444 East Colorado Blvd., Glendale 5, Calif.

Originally designed for use with ice cube machines, a scoop molded of lightweight, rugged Tenite II cellulose acetate butyrate is now available as a general utility scoop for farmers, poultry breeders, gardeners, and other commercial users. Sturdy one-piece construction of the scoop includes a comfortably shaped, warm-to-the-touch handle. Though it weighs less than aluminum, the scoop is exceptionally durable and will not shatter, chip, or corrode. Its smooth surface can be easily washed or wiped clean after it has been used. Manufacturer is Minnesota Plastics Corp., 366 Wacouta St., St. Faul 1, Minn.



By using flexible Vinylite shapes, children can now create imaginative designs and figures without the mess of paint, crayon, or paste. Slight pressure with the fingers sticks the shapes to any glossy surface. They strip off easily and cleanly. The reusable shapes, in several bright colors, resist abrasion or tearing and are easy to keep clean. The kits are made by Colorforms, 340 Hudson St., New York 13, N. Y.

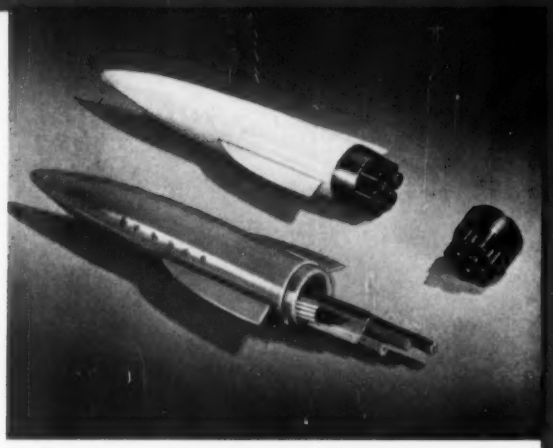
Children's night light, molded of Tenite II cellulose acetate butyrate, combines practicality with ornamentation. The lamp, designed with a colorful comic gnome as its appealing central design, gives forth a subdued light which will not keep the child awake. The Juvenile Nite Lite is available from Burwood Products Co., 1953 E. Bay Shore Rd., Traverse City, Mich.

Firetruck pull toy, molded of Hercocel A cellulose acetate, brings action, color, and noise to the nursery. When pulled across the floor, three realistically molded Teddy-bear firemen on the truck bob, turn, and whirl completely around, a gong clangs, and the "eyes" in the truck's headlights roll. The acetate toy is sturdy and capable of withstanding long hours of hard use in the hands of children. The Zoo Fire Truck, in an attractive combination of color-fast bright reds and yellows, is a product of the Irwin Corp., 200 Fifth Ave., New York 10, N. Y.

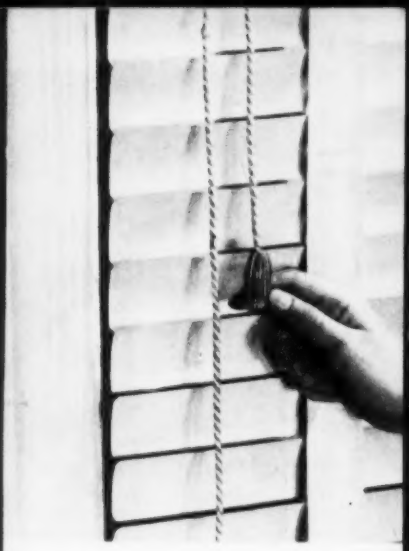
Self-adjusting carborundum hone for a scissors sharpener is suspended in a free-wheeling position between the two halves of a rugged styrene frame. To put a new cutting edge on any size scissors, the blade is straddled over the hone and pushed forward. A rubber tip at the bottom of the red frame prevents the unit from skidding. Made by John Dritz & Sons, 1115 Broadway, New York, N. Y.

For the first time, cutlery handles are being molded of Melmac to take advantage of the durability of melamine. The handles, designed for easy gripping, are able to take every-day abuse without chipping or breaking and are not harmed by hot water. Their lustrous ivory color cannot fade or chip off. Handles for the 5-piece set, which includes a slicer, utility knife, parer, and two carving knives, are by Michigan Molded Plastics, Inc., 7931 G. St., Dexter, Mich.; set is distributed by Chas. D. Briddell, Inc., 821 Dryden Ave., Crisfield, Md.

PRODUCTS



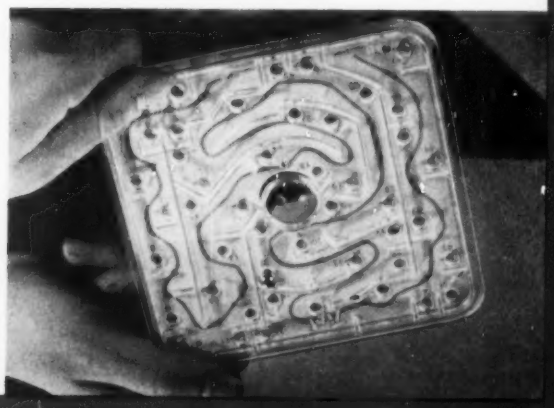
For the benefit of today's space-conscious youngsters, the traditional schoolboy's pencil box has been dressed up in a streamlined styrene rocket ship case. The rear section of the case is designed to resemble a set of jet exhaust pipes and easily uncaps to provide access to the various school supplies stored in the spacious hollow interior. Assembled to the inside of this rear section is a pencil sharpener, also molded of styrene. The Space Ship Pencil Box, in bright red or yellow, is manufactured by the Sterling Plastics Co., 1140 Commerce Ave., Union, N. J.



The annoying clatter caused by cord pulls that sway against venetian blinds is eliminated by using tassels injection molded of polyethylene or polyvinyl chloride. The flexible, attractive pulls are completely noiseless and will not break when accidentally stepped on or caught in the window. They are made by Clear-Cite Products, 2218 Lincoln Ave., Chicago 14, Ill.

Pocket-size game of skill, with styrene base and styrene barriers, utilizes the popular maze-puzzle principle. The transparent styrene base is assembled over a cardboard background printed to resemble the holes and obstacles of a golf course. Each hole into which the steel ball is rolled represents a different value. When the game is not in use, the ball can be handily stored in the deep, bowl-like center of the game. Called "Tipt," it is molded by Kollar-Craft Plastic Products, Inc., Fenton, Mo., for Northwestern Products, 2655-2721 Spruce St., St. Louis 3, Mo.

Handy letter opener, molded of Bakelite styrene, is available in either of two models—a desk top model which holds a pen or pencil and a model designed as an attachment to a daily reminder pad. Envelopes are opened without harming their contents by simply drawing them through a slot at the bottom of which is a tiny blade. Distributed by Emenee Industries, 200 Fifth Ave., New York 10, N. Y.



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Basic Principles of Injection Molding†

by C. E. Beyer†† and R. B. Dahl††

The controls available to the injection molding machine operator can be separated into two groups. Since the quality of the molding is primarily determined by the pressure in the mold and the temperature of the plastic at the time the gate freezes, the controls that directly affect this sealing pressure and temperature are classified as the primary controls. The other controls that either have no effect on the sealing pressure and temperature, or are pre-determined by the primary controls, are classified as secondary controls. The effect of these controls on the sealing pressure and temperature during molding is discussed, as are also some of the mechanical devices for producing the desired sealing point, such as the weigh feeding process and the ball check nozzle.

IN THE past 20 years, shot size of injection molding machines has grown from a few ounces to the 300- and 400-oz. machines in use today, with even larger capacities being planned. Even with this tremendous growth in the size it has only been in the last few years that much work has been done on obtaining an understanding of the basic principles of the injection molding process.

The operators of the giant molding machines now in use have the same controls as the operators of machines in the past. The molder of today knows that to produce a molding of the highest quality he must have the correct relationship between 1) injection temperature, 2) injection pressure, 3) plunger forward time, 4) mold temperature, 5) mold closed time, 6) mold open time, 7) clamping force, and 8) plunger speed.

Controls Interrelated

Most of these controls are so interrelated that a simple adjustment is not possible. For example, if the injection temperature were increased the mold may start to flash so that the injection pressure may have to be reduced. At this lower pressure the plastic may fill the mold slower so that the plunger forward time may have to increase.

In describing the relationship between the various controls available to the injection molding machine operator, they can be separated (see Table I) into two classifications; a set of primary controls which directly control the quality of the molding, and a set of secondary controls which either do not directly affect the quality of the molding or are predetermined by the settings of the primary controls. A quick summary of the injection molding cycle is sufficient to show why each of these controls was classified as either primary or secondary.

The plastic is forced into the mold by the pressure of the injection ram at the temperature of the molten plastic, not necessarily that of the temperature controller settings. The pressure in the mold has been measured to be anywhere between 25 and 50% of the injection pressure. After the material has completely filled the mold there is a short packing period where the injection ram holds the pressure in the mold as the plastic cools. The rate of cooling depends upon the temperature difference between the plastic and the mold. The plunger then returns to its starting position.

If the material in the small restriction at the entrance of the mold, commonly called the gate, has not cooled sufficiently to withstand the pressure in the mold there will be some discharge of plastic from the mold. This will lower the pressure in the mold to a pressure that the material in the gate can withstand. The mold is now separated from the rest of the machine and the quality of the molding has been established. The rest of the cycle consists of letting the plastic cool so that it may be removed from the mold.

Thus the primary controls are those which determine the pressure and temperature at which the gate seals, and consequently, the quality of the molding. A good molding is defined as one free from sinks, bubbles, scoring, cracks, etc., which primarily depend upon having the correct amount of plastic in the mold. There are other defects that may appear in the moldings, and some of these are discussed from time to time.

The mold used to investigate the effects of the control variables on the mold pressure and plastic temperature was the same box mold described by Gilmore and Spencer.[1]

[1] All references are to Bibliography on page 179

Table I—Injection Molding Controls

Primary Controls	
1)	Injection temperature
2)	Injection pressure
3)	Plunger forward time
4)	Mold temperature
Secondary Controls	
5)	Mold closed time
6)	Mold open time
7)	Clamping force
8)	Plunger speed

* Reg. U. S. Pat. Off.

† This paper won first prize in the 1952 Annual Prize Paper Contest conducted by the Society of Plastics Engineers, Inc.

†† Dow Chemical Co., Midland, Mich.

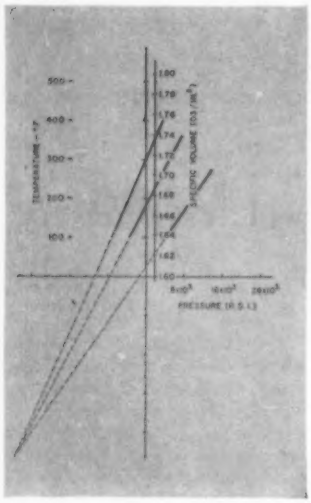


Fig. 1

The mold is a conventional type mold with a box shaped cavity. The size of the box is 4 by 4 in. with a 2.500-in. draw. The gate dimensions are 0.035 by 0.375 in. with no land length. The wall thickness is 0.170 in. with a resultant shot size of 6 oz. in polystyrene. The pressure pickup was mounted in cavity insert. The pressure measuring device works on the mutual inductance principle and is described in detail by Towsley.[2] The cooling characteristics of this mold are known so that the average plastic temperature can be calculated at any time.

Pressure/Temperature

While the material is cooling in the mold, the mold pressure/plastic temperature relationship can be determined from the equation of state[3] of the material. For polystyrene the equation of state is

$$(P-\pi)\ (V-v) = RT$$

where P = pressure in mold,
V = specific volume,
T = temperature,
π, v, and R are constants depending on the material.

For the constant volume situation that exists in the mold, this equation when plotted with pressure and temperature as the coordinates as shown in Fig. 1 would give a series of straight lines that would intersect at a temperature of absolute zero and a pressure $-\pi$ p.s.i. with the slope of the line depending on the density or the weight of plastic in the mold cavity.

As the plastic enters the mold, the outer portion that touches the mold surface freezes almost instantaneously and as time goes on this layer increases in thickness until the whole molding is frozen. The gate is usually the smallest restriction in the system so that it will be the first place to freeze off. As the material cools the effective size of the gate keeps decreasing and the size of this orifice will depend upon the average plastic temperature.

Thus, if the plastic temperature is lower, the diameter of the molten plastic in the gate will be smaller thus holding a higher pressure in the mold. When this pressure, effective diameter, and rate of cooling come to equilibrium so that there is no flow through the gate the mold is then completely separated from the heating cylinder and the gate can be considered sealed. Below this sealing point the pressure and the plastic temperature will follow a line of constant density given by the equation of state for the material.

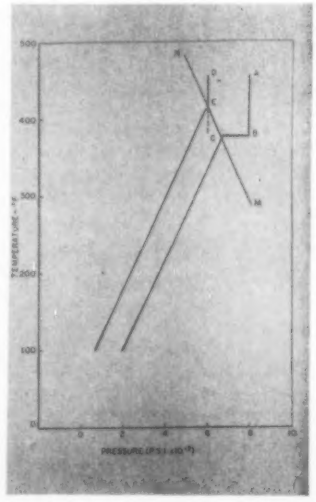
Sealing pressures can be determined experimentally from the pressure measurements and the point at which the cooling curve crosses this sealing pressure will give the sealing pressure and temperature required to give that specific weight of molding. Several of these sealing points were determined by this method. For this mold these sealing points lay along line MN of Fig. 2. In a complicated mold, particularly for a very thin section molding, the pressure in the mold is not uniform, so that the experimental values of these sealing pressures will depend on the point at which pressure measurements are taken. This was then the sealing line for this particular mold below which the mold is completely isolated from the molding machine.

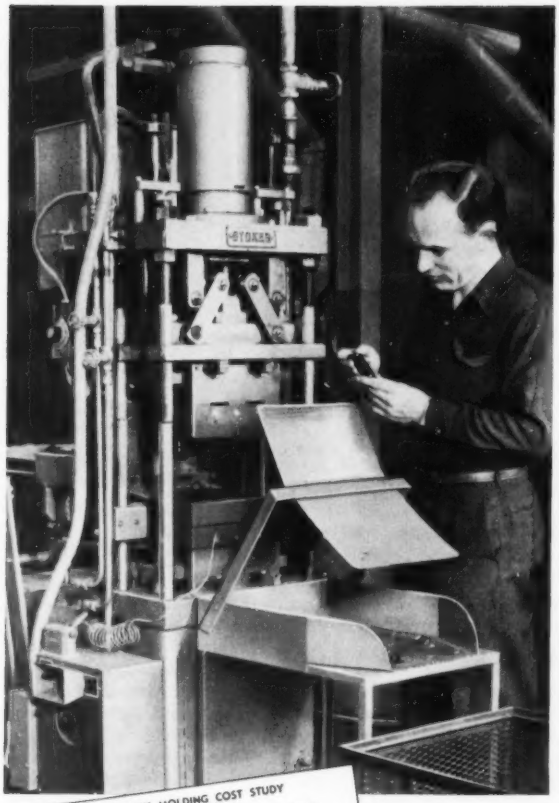
The quality of the molded article is largely determined by the point where the pressure-temperature curve crosses this line. For example, if the sealing temperature was decreased the sealing pressure would be greater resulting in a heavier molding. The position of this sealing line will depend largely on the design of the particular mold and the size of the gate.

To explain the effects of the control variables on the molded article, the mold pressure and plastic temperature at some point in the mold can be followed on a graph with the same coordinates as Fig. 1. The molten plastic is forced into the mold by the injection ram. After the mold has filled the pressure builds up to some value. This initial temperature and pressure is shown as point A on Fig. 2. During the packing portion of the cycle the plastic will cool while the injection ram keeps forcing material into the mold to maintain the mold pressure (line AB). At point B the injection ram releases the pressure and returns to its starting position. If the gate has not frozen there will be an almost instantaneous discharge from the mold, dropping the pressure down to the sealing pressure, (line BC). Once the gate has sealed the mold, pressure and plastic temperature will fall off according to the equation of state.

If the injection pressure were lowered (D), so that the gate sealed before the plunger returned, the pressure and temperature would follow the line given by the equation of state, and the amount of plunger forward beyond this sealing point will have no effect on the weight of the piece. From this it can be seen that the weight of the molding is determined by the pressure and temperature at which the gate seals. Thus the major purpose of the primary controls and even such refinements as weigh feeding and ball check nozzle is to give the correct

Fig. 2





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PRODUCTION DATA

COST DATA/M

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mold pressure and plastic temperature at the time the gate seals.

Secondary Controls

1) *Mold Closed Time or Cooling Time.* Gilmore[4] has found that to prevent sticking or scoring of the molding, the mold pressure must be close to zero when the mold opens. If the molding has a core there will be a certain minimum value of the mold pressure to allow the molding to be removed from the core. The mold pressure range where the mold can open is shown $+ P_H - P_L$ in Fig. 3.

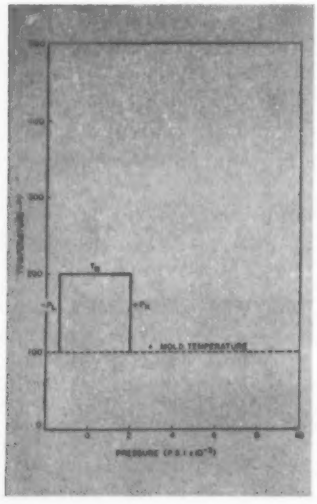
To prevent warpage or distortion of the molding there is a maximum plastic temperature at which the piece can be removed from the mold (T_M). This temperature will depend largely on the section thickness and the residual strains in the molding. The cooling time must be adjusted so that the mold will open when the plastic temperatures and the mold pressure are within the boundaries $+ P_H$, $- P_L$, T_M and the lower temperature limit which is the mold temperature below which the plastic cannot cool. The shortest cooling time is that when the pressure/temperature curve crosses one of these boundaries.

2) *Mold Open Time.* The mold open time is determined by the time taken to open the mold, remove the piece, and close the mold again. This is usually kept as short as possible but at times it may be lengthened so that the plastic will remain in the heating cylinder longer to reach a more uniform temperature.

3) *Clamping Force.* The clamping force required to prevent the mold from flashing depends upon the injection pressure and the cross-sectional surface area. It is usually set high enough to prevent the mold from parting under pressure and under these conditions has no effect on the quality of the molding.

4) *Plunger Speed.* The plunger speed or the rate at which the mold fills does have some effect on the sealing pressure and temperature since it determines how much the plastic cools before the mold is full. The rate of flow is determined by the injection pressure and temperature up to a maximum rate limited by the capacity of the hydraulic pump. In some cases, particularly in heavy section molding, it may be necessary to reduce the plunger speed to prevent burning of the plastic or production of other surface blemishes.

Fig. 3



Primary Controls

Most of the plastics ordinarily used in injection molding machines are very poor conductors of heat. The plastic will not remain in the heating chamber long enough to reach the temperature set on the controllers. Therefore, the plastic temperature as it leaves the nozzle not only depends on the heater settings but also on the rate that the plastic moves through the heating chamber. A method of measuring the plastic temperature and relating it to the heater settings and the output rate has been described[5].

The hydraulic system of the molding machine is set to deliver a predetermined hydraulic pressure to the injection ram. There is a large pressure drop through the granules in front of the ram which will vary with the amount of granular material ahead of the ram and the temperature of the cylinder wall around these granules[6]. There will also be pressure drops through all of the restrictions and channels between the ram and the mold. There will even be a pressure drop through the mold cavity itself. Thus for any given injection pressure the pressure in the mold at any point will depend upon:

1) The position of the ram at the end of its stroke; 2) the temperature of the rear of the heating chamber; 3) the temperature of the plastic; and 4) the pressure drop in the mold.

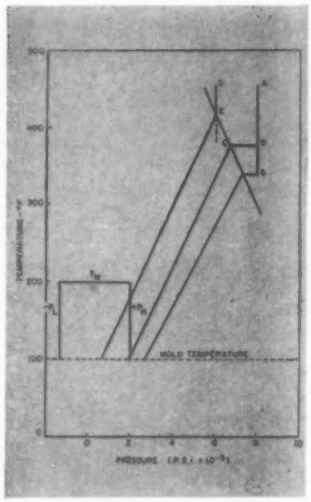


Fig. 4

The primary function of both the injection temperature and pressure is to fill the mold with the required amount of material in a fluid state so as to prevent weld lines or surface marks. If the pressure built up in the mold is below the required pressure to make a good molding there will be excessive sinks or bubbles regardless of the plunger forward time. Therefore to make a good molding the pressure in the mold and the plastic temperature when the mold has filled must be greater than the sealing pressure and temperature required to give the proper weight molding. In all practical cases, to fill the mold at a reasonable rate with the pressures available, the plastic temperature must be much higher than the temperature at which the gate seals. While the plastic is cooling to the sealing temperature, more material must be forced into the mold to compensate for the contraction of the plastic in cooling and to maintain the pressure in the mold. This packing period can be shown (Fig. 4) as a vertical line extending below the filling point. This packing period will extend until the plunger forward timer times out and returns the plunger (AB). Then the mold will discharge down to the pressure that the gate will hold in the mold at that temperature (BC).

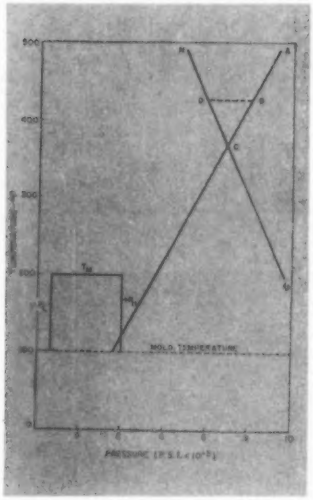


Fig. 5

If the mold pressure at filling was low enough so that the gate seals before the plunger is returned, any additional plunger forward time beyond the sealing point will have no effect on the molding (DE). On the other hand, if the gate does not seal, additional plunger forward time (BG) will cause the weight of the mold to increase. In this case the weight of the box is too large so that the cooling curve does not pass through the boundary limits ($+P_H$ and T_M) for removing the piece and therefore the pressure in the mold is too high and scoring of the molding will result.

Rate of Cooling

The plunger forward time necessary to cool the plastic to the proper sealing temperature depends upon the rate of cooling of the plastic, and, since the rate of cooling is proportional to the temperature difference between the plastic and the mold, the plunger forward time is slightly dependent upon the mold temperature. The greatest effect of mold temperature is in determining the pressure and temperature of the plastic as the mold fills. If the mold temperature is too low, there will be too much cooling in the sprue and runners and also in the mold cavity itself, particularly in thinner sections, to produce a good surface on the molding.

The purpose of weigh feeding and the various types of nozzle and gate valves is to maintain a closer control on the sealing pressure and temperature. In weigh feeding, only the correct amount of material is placed in the mold. Because no excess material can enter the mold, the mold pressure cannot be above that required for a good molding at the time the gate seals. As long as the plunger forward time is sufficient to allow the gate to seal and prevent discharge, all of the moldings will have the same weight, producing a more uniform product. Another advantage is that the injection pressure can be much higher, giving faster filling without getting excessive mold pressure.

In weigh feeding, all of the material goes into the mold during the filling operation; there is no packing period where the plunger forces material into the mold to replace the shrinkage due to cooling. (Figure 5). As soon as the mold is filled and the plunger reaches the end of its travel, the mold is effectively sealed so that the pressure and temperature will follow the cooling curve given by the equation of state for that weight of material (AC).

As long as the plunger is held forward until the pressure and temperature cross the sealing line, a good molding will result; but if the plunger forward time is too short (AB), there will be some material discharged from the mold, giving a molding that is lighter than is necessary. This situation leads to more trouble than just one light molding. Since the one molding is light and the exact weight is being fed into the machine for each shot, there will be too much material in the machine for the next shot which will then come out heavy. In practice, this excess material does not come through in the very next molding but seems to build up in the machine and every so often a heavy molding is made that will probably be scored, or will even stick in the mold. In molding by weigh feeding, it is necessary to have a long enough plunger forward to prevent discharge.

Ball Check Nozzle

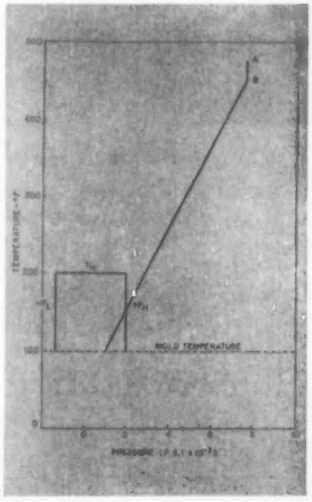
One type of nozzle valve used in injection molding is the ball check nozzle. The advantage of the ball check nozzle, as with all nozzle and gate valves, is similar to the advantage of weigh feeding; that is, to mechanically seal any desired pressure and temperature in the mold. Since in any molding operation the temperature of the plastic varies, and also the rate of cooling may vary, the gate will not always seal at the same point of its own accord. With a mechanical seal, the only variations will be the small variations in pressure drop through the heating chamber, causing only a small variation in the mold pressure.

The ball check nozzle allows the plastic to flow into the mold but does not allow the material to discharge out of the mold. This is, in effect, sealing the mold when the plunger releases its pressure. As in weigh feeding, the mold can be sealed at a higher pressure and temperature, thus giving the advantage of higher injection pressure and faster filling of the mold. With the ball check nozzle there can be no sealing line and the sealing point can be anywhere along the line given by the equation of state for the correct weight that will produce a good molding.

In Fig. 6 the mold is filled at some pressure and temperature determined by the injection pressure and heater controls. During the plunger forward time there is packing into the mold the same as in conventional molding (AB). But as soon as the plunger returns the gate is sealed at a pressure and temperature higher

(*Continued on p. 179*)

Fig. 6



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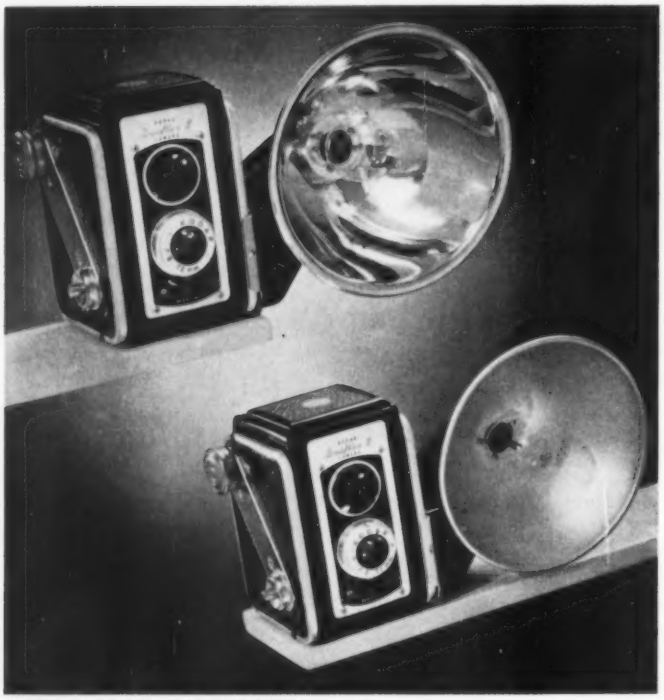
Metallized Butyrate Reflectors

Engineering development work has overcome the difficulties of applying a bright reflecting surface to a molded butyrate part



All photos this article courtesy Eastman Kodak Co.

Metallized cellulose acetate butyrate reflector (top) gives about 50% more illumination for flash photography than common satin-finish reflector (bottom)

AMATEUR photographers who purchase Eastman Kodak's popular Duaflex flashholder with the new Lumaclad plastic reflector will probably never realize the tremendous amount of research and development that have gone into this recently announced product.

The new reflector, made with a combination of materials heretofore looked upon as impossible, has a beautiful mirror-like finish that is tough and durable. Its shape has been carefully engineered to provide best possible reflection. And these two factors, combined with special surface coatings, yield a superior reflector giving about 50% more illumination for flash photography than the common satin-finish reflector.

Kodak's search for new materials that resulted in the Lumaclad reflector began some time ago when an aluminum shortage seemed imminent. After preliminary experimental work that included a study of metals, plastics, paper laminates, and similar materials, it was concluded that a good reflector could be produced using a plastic material for the base shell.

But this shell would then have to be coated with a satisfactory reflecting surface or pigmented with a reflecting filler. Sprayed aluminum bronze lacquers, white pigmented lacquers, inorganic reflecting finishes, a surface covered with glass beads, and vacuum deposited aluminum were tested to develop a proper reflecting surface. The latter showed immediate promise since it had much higher reflectivity than any of the other surfaces and had excellent eye appeal.

Difficult to Metallize

There were already on the market many types of reflectors, emblems, and toys molded of plastics and metallized by means of vacuum deposition. However, the specifications placed by the Design Engineering Dept. at Kodak's Camera Works on the physical characteristics of the proposed reflector were such that none of the materials currently used in conjunction with the metal evaporating process appeared adequate. From the standpoint of physical properties of the base material, the best choice appeared to be cellulose acetate butyrate, Tenite II, a material normally difficult to use with the evaporating process. Combining Tenite II and the metal evaporating process has been the goal of many months of intensive research, testing, evaluation, and development.

The difficulty in using Tenite II in vacuum deposition stemmed from the inability to reach a required vacuum on that plastic without an inordinately long pump-down time. Also, there were no lacquers or other finishes available which would act as a satisfactory barrier coat against the outgassing of the Tenite (which produced long pump-down periods) and at the same time have satisfactory adhesion to the base shell. It was these factors which—until now—had limited the use of Tenite II in metallizing. Recognizing that Tenite II had many other fa-

Test samples of reflector were formed from acetate sheet

Using hand hook, operator removes reflectors two at a time from 4-cavity mold

vorable properties which made it excellent as a reflector shell, it became necessary to develop a coating which would permit use of the plastic on a production scale.

Reflector Specifications

The specifications set by the Design Engineering Dept. for the proposed reflector were:

1) Material for the base must lend itself to comparatively accurate fabrication, to permit forming to an optically designed reflecting contour.

2) The reflector must have a high reflectivity factor.

3) The surface must not tarnish nor deteriorate even under severe exposure.

4) The reflecting surface must adhere satisfactorily to the base material.

5) The finish must not fingerprint nor mar too easily.

6) It must withstand reasonable impact.

7) It must lend itself to large scale conveyor-type production in order to minimize production costs.

8) Materials and production techniques must be reproducible to insure uniformity of product.

It was evident that if production schedules were to be met, a projected manufacturing procedure would have to be evaluated so that equipment could be designed, purchased, and installed concurrently with the development program of the reflector itself. This had to be done before exact knowledge was available of the materials and the finishes to be used eventually.

Cast Phenolic Dies

To study the practicality of a plastic shell made of Tenite II, preliminary samples were made from sheet material using cast phenolic dies to form the sheeting. A standard aluminum metal reflector was coated with a vinyl paint which gave good mold release. Phenolic casting resin was poured into the coated metal reflector and cured in an air circulating oven at 180° F. for 2 hours. While cure was taking place, a steel bolt was inserted in the center of the casting. This bolt was then used to attach the cast forming die to the ram of a hydraulic forming press. By means of a similar technique, the aluminum metal reflector was again used as the mold for making the female portion or cavity of the forming tool.

Clear 0.062-in. acetate sheeting (Tenite I) was preheated with Calrod strip heaters, placed over the cavity, and formed by pressing the force into the softened acetate sheet. Molds were at room temperature and a force dwell of about 10 sec. set up the acetate sheet into a rigid reflector shell. Excess sheeting was trimmed and the bulb and locating holes were cut in with hand tools. Shells made in this manner were used in the studies to develop a proper reflecting surface.

With this preliminary work as a base, a reflector was designed having an ideal curve for maximum photographic reflectivity. A single cavity mold was designed and built for a 4-oz. vertical laboratory injection press. The mold was a conventional 2-plate mold with the reflector being molded by means of a disk gate which was cut away from the molded shell by the stripper action of the machine. To reduce surface defects which might be caused by handling, an automatic degating principle was designed, eliminating hand-cutting of the gate. The cavity and force were made from manganese oil-hardening steel with a standard DME hold frame.

The single cavity mold was cored for temperature control in the die plates, and water lines were placed around the cavity and into the force itself. Holes were drilled into the mold proper so that immersion thermometers could be attached permanently for ready observation of mold temperatures.

In its original design, the reflector had a U-shaped turn-back rim. This presented a lacquer draining problem and the U-shaped edge was replaced with a solid rim which is approximately 100% heavier in cross-section than the main portion of the reflector. This reduced the lacquer drainage problem but accentuated molding difficulties.

Production Molds

From data obtained through the use of this experimental mold, two 4-cavity production molds were built, having the following detail:

A) The stationary die plate or

sprue bushing plate is cored for cooling. The runner system is located in this plate.

B) The cavity plate, also cored for temperature control, contains the sprue bushing which is a special narrow orifice.

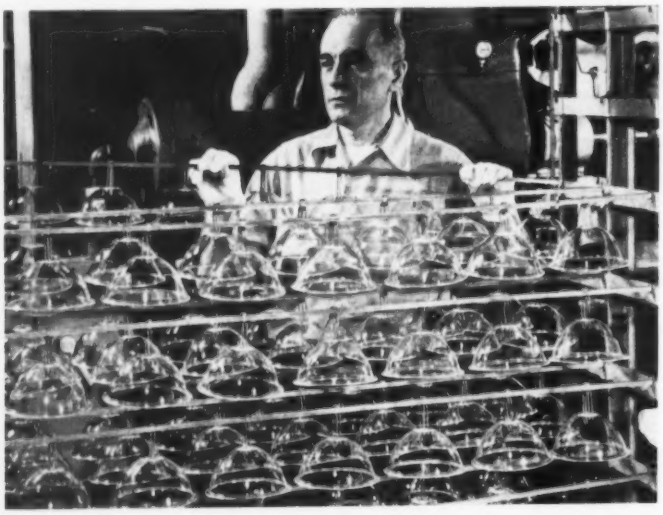
C) Part of the rim of the reflector is formed by the third plate, the stripper plate. This stripper plate likewise is cored for temperature control.

D) The fourth plate contains the cores which form the reflector.

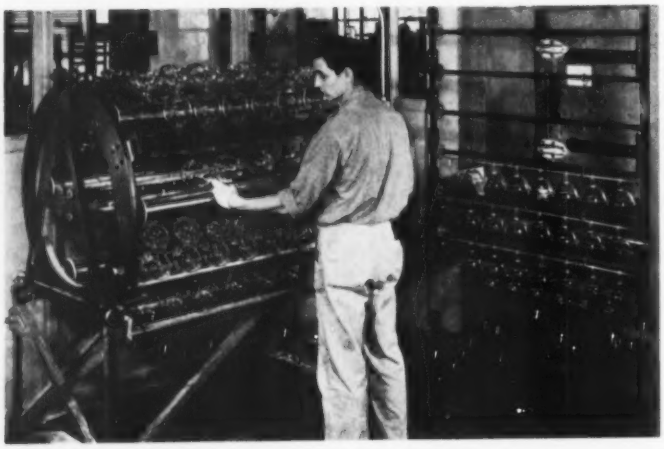
The machines used in molding the reflectors are equipped with hopper dryers. Hopper feeders to assure full hoppers at all times are being installed.

The molded parts are removed with a hand hook which picks out two reflectors at a time. The reflectors are placed with the rim down directly on a clean, cloth-covered bench. While the press is closed, the operator picks up the molded reflector on spring clamps attached to riser rods used to carry the shells through dipping, baking, and metallizing operations. With this technique the reflector is never touched by the operators' hands.

While studies were being made with the single-cavity laboratory mold to develop optimum molding conditions, the shells produced during these experimental moldings were used to evaluate finishing materials. An examination of virtually hundreds of finishing materials on the market revealed no single finish that met all the necessary requirements for a good complete finishing system; so a new system had to be developed.



Riser rods, to which the molded reflectors have been attached, are loaded on trucks



After base-coating and baking, reflectors are placed in horizontal metallizing fixture

Base Coat Important

Among characteristics required for the base coat finish were:

1) Adhere well to the Tenite II surface.

2) Cover minor mold scratches.

3) Provide a barrier coat to prevent out-gassing during vacuum processing.

4) Provide a good high gloss base for metallizing.

5) Solvents used should not adversely affect the Tenite II.

6) Bake out at a temperature which would prevent distortion of plastic shell.

7) Dip satisfactorily free from runs, sags, drips, etc.

8) Air dry rapidly to reduce adhesion of dust particles.

It was necessary that the base coat should not check, craze, or attack the surface of the Tenite to any perceptible degree, as this would adversely affect the mirror-like, high reflecting coating.

Some of the properties sought in the top or final coat included:

1) Should not discolor nor affect the brilliance of the aluminum.

2) Adhere satisfactorily to the aluminized surface without distorting its mirror-like qualities.

3) Must be water-white, transparent, and have a high gloss.

4) Remain water-white under extreme weather conditions, as any perceptible yellowing would adversely affect the reflectivity.

5) Have good mar resistance and be tough, scuffproof, and sufficiently elastomeric to resist chipping.

6) Have good fingerprinting resistance.

7) Withstand some degree of flexing without breaking.

8) Air dry rapidly to reduce adhesion of dust particles.

In developing a finishing system

Dipped rotors are rotated in curing oven at 300° F for 1 to 2 hours to assure even distribution of the resin and prevent wasteful drain-off of resin.

Aviation generator rotors before impregnation with LAMINAC 4128.

After impregnation—a tough, durable insulating coating is formed.

LAMINAC® Resin 4128 cuts impregnation time of generator parts from 70 to 4½ hours—reduces rejects 15%!

rotors impregnated with LAMINAC withstand terrific centrifugal force and heat of 6,000 rpm speeds!

Needed: By Eclipse-Pioneer Division of Bendix Aviation Corporation, a more efficient and economical method of impregnating rotors, stators and other electrical windings for aircraft generators. Former methods were time-consuming, had high reject rates. Former materials would gas or soften at high operating temperatures.

Chosen: LAMINAC Polyester Resin 4128, for its excellent electrical properties, high heat resistance, good rigidity and rapid curing—LAMINAC 4128 worked better than any other material tried.

Specifications: *Insulation:* each strand of cotton-wrapped wire completely insulated against moisture and arcing. *Strength:* each strand firmly anchored despite high centrifugal force and heat generated by speeds of 6,000 rpm at high altitudes.

Success: Impregnation time cut from three days to 4½ hours—only one dip required, solvent loss and post-cleaning completely eliminated, rejects cut 15%! Performance matches production efficiency, too. Tests have proved that LAMINAC impregnated parts operate efficiently at high voltages and temperatures without significant variations in electrical characteristics. Here are economies and efficiency applicable to many types of electrical equipment!

✓ **REMEMBER . . .** only in the large family of LAMINAC polyester resins will you find the combination of curing and service qualities you need in superior degree. We will be glad to help you determine the right LAMINAC resin for your requirements in electrical and other applications.

LAMINAC® polyester resins . . .

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with the above properties, the technical services of the Reliance Varnish Co., Louisville, Ky., were solicited in a joint research venture.

In evaluating both the base coat and the top coat, it was found that all studies had to be made on molded shells as it was learned in the early studies that results obtained on Tenite plaques or sheets were not comparable to the results obtained on molded parts. This was emphasized when it was found that certain solvents would detrimentally affect the Tenite shells, making them brittle; this condition could not be evaluated unless experiments were conducted on molded shells. It became evident that it was not only necessary to obtain a good base and a good top coat but great care had to be exercised to obtain a satisfactory solvent balance.

Over 3000 Tests

After coating approximately 40,000 reflectors produced in the single cavity mold and making over 3000 tests of over 500 formulations which were modifications both of solvent balance and resin combinations, a finish was obtained with properties in excess of the limits originally sought. For instance, the adhesion of the entire system to the Tenite shell is far above that originally thought possible.

Most of the finishes examined failed either because they did not have sufficient adhesion; because they resulted in frosted or iridescent coatings; because they provided poor resistance to temperature and humidity changes; because the vinyl flashguards stuck to the coatings or pulled them off completely; or because the base coat did not provide sufficient barrier to permit rapid vacuum pump-down time during metallizing.

During all of this evaluation it was necessary to run a complete cycle in order to evaluate coatings because quite frequently a base coat or a top coat which seemed satisfactory was found to yield unsatisfactory properties when used in combination. This factor, of course, multiplied the number of experiments tremendously.

Dipping operations are carried on in an air-cooled room in which the incoming washed air places the room under slight pressure. The base and top coat lacquers are periodically filtered and riser rods are stripped and cleaned after each cycle.

Concurrent with the study and development of coating materials and methods of application, production techniques were developed for metallizing. In these studies, the cooperation and services of the technical personnel of Distillation Products Industries (now Consolidated Vacuum Corp.) were most valuable.

Coating Technique

This is the coating technique as now followed in production:

Metallizing operations are carried out in a 48-in. horizontal coater. Coating fixtures are standard six station units. These rods carry the parts through dipping and baking and are equipped with evenly spaced U-shaped spring clips to hold the reflectors. These clips are easily and economically replaced when damaged beyond the point of adjustment.

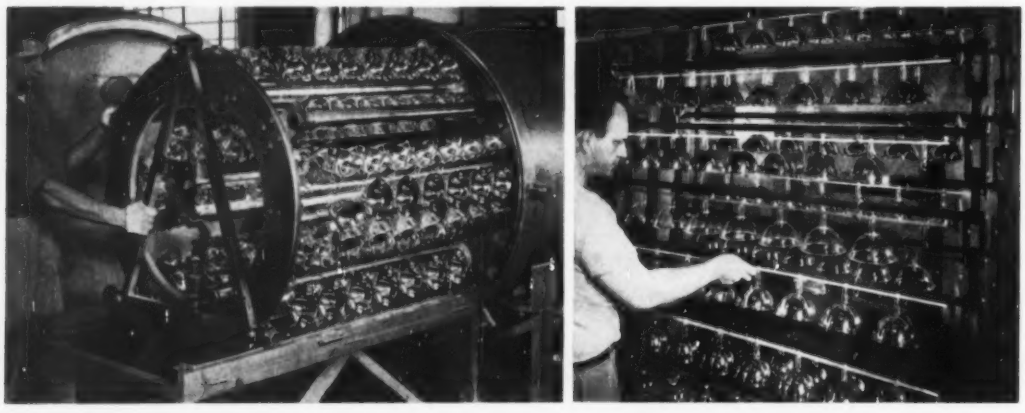
In practice, the rods carrying base coated reflectors are taken from the oven conveyor and placed in clusters on each of the fixture's six rotating stations. This load is then rolled into the bell jar and the aluminum coating operation carried out.

Great care must be exercised to avoid letting parts stand out for any length of time, as moisture pick-up is very rapid and pump-down times can be doubled or tripled by poor scheduling. In normal production, oven speed is synchronized to the coating cycle. A load is taken from the oven conveyor and racked on one coating fixture, broken filaments are replaced and filaments reloaded with aluminum hairpins on a second, while pump-down and coating operations are taking place within the bell jar on the third fixture. This complete operation is synchronized to be carried out by one operator. After metallizing, the reflectors are top coated and sent through the oven for the final coat bake.

The present molding, lacquering, and metallizing "flow sheet" is as follows:

1) Mold shells in 4-cavity molds in machines such as a Lester-Phoenix 20-oz., fully equipped with controls.

2) Load riser rods at machines



Metallized units are rolled out of vacuum chamber (left). Rods are removed (right) from oven conveyor after top coat of lacquer has been baked

How the appliance industry benefits from *shock*-resistant G-E RUBBER-PHENOLICS

Here's an example from the appliance industry showing how the outstanding abuse resistance of General Electric rubber-phenolic compounds helps solve troublesome breakage problems and adds greater sales-appeal to products.

The Salton HOTRAY, equipped with radiant-heated glass to keep food piping hot, requires an unusually rugged plastics material for its frame. A G-E rubber-phenolic was selected because:

- it resists the 200 F temperature
- it insulates the user from high-temperature glass
- it provides a sturdy, *graceful* frame which withstands abuse in assembly and use
- its satin finish promotes customer acceptance
- its shock resistance eliminates need for unsightly reinforcement.

Plastics frames for Salton Manufacturing Company's unique electric HOTRAY are molded by Consolidated Molded Products Corporation of a resilient G-E rubber-phenolic molding material for improved strength, greater sales-appeal.

Where can G-E rubber-phenolics help you?

G-E rubber-phenolics, which have *five times* the shock resistance of conventional impact materials, now meet the demand of many industries for an easy-to-mold plastics with improved abuse resistance. Perhaps they can help *you* obtain stronger, better-looking plastics parts. Ask your molder about them, or send the coupon for a free booklet with more details.

You can put your confidence in

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( ) Please send me a free copy of "New Rubber-Phenolic Materials for Greater Impact Strength."

( ) I am particularly interested *in* G-E rubber-phenolics for _____

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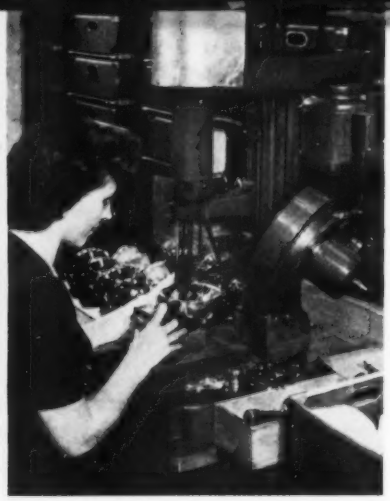
Accelerated aging test to determine degradation is part of an extensive inspection



Self-tapping screws secure reflector to case handle

with eight shells on each of the rods.

3) Truck lot of parts to dip area.

4) Clean rod and parts with a filtered ionized air jet.

5) Dip rod of parts into base coat and hang on conveyorized drain rack.

6) Unload from drain rack, load on oven conveyor and bake approximately 1 hr. at about 170° F.

7) Unload from oven, rack rods on coating fixture, and metallize.

8) Return parts to dip area.

9) Dip rod of parts into top coat, hang on conveyorized drain rack, bake as #6.

10) Unload, place on conveyor to inspection and packing bench, and then to assembly.

Inspection

After finishing, the quality control department inspects reflectors for all physical defects including runs, dirt, and handling defects. It also checks flexing, impact resistance, and adhesion properties and conducts accelerated aging tests to determine whether any of the properties are degraded during aging. During all this inspection the reflectivity characteristics are carefully watched. In addition to accelerated aging checks, samples are periodically set aside for examination after natural aging.

After this strict inspection, reflector shells are shipped to an assembly department where Kodak Exposure Guide decals are applied. The Lumaclad shells are assembled to battery case handles by driving self-tapping screws into three holes in the reflector and handle. Each flashholder then receives a final inspection before packaging.

Since it is possible to have several thousand reflectors in process before the finished reflectors are examined, controls are established throughout the operation to insure uniformity in molding techniques, viscosities, solvent balance, solids of the base coat and similar characteristics of the top coat, baking time, temperatures, and metallizing. The chemical laboratory constantly checks materials used throughout the process in order to maintain quality standards. These chemical checks also permit periodic adjustments to be made in solvent balance and solid content of lacquer materials before they are out of balance sufficiently to cause defective parts.

In the course of the development of the Lumaclad reflector a number of tests had to be devised to properly evaluate progress being made. These include adhesion tests, pendulum and drop impact tests, flexing tests, accelerated aging tests—including long time exposure in the Kodak Tropical Testing Laboratory in Panama—natural aging tests, aging tests in contact with vinyl flashguards, wear and fingerprint resistance tests, and mar and scuff resistance tests.

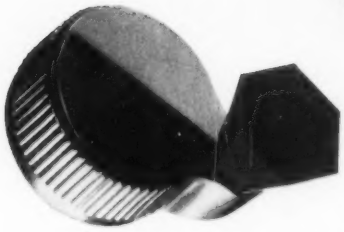
Final Results

After many months of testing, comparing, revising, and evaluating Tenite II formulations, finishing materials, and metallizing techniques, a total system was finally developed which yields a very satisfactory Lumaclad reflector and meets requirements which at times looked hopeless of solution. These results were obtained only through the diligent effort and cooperation of not only the various departments within the Eastman Kodak Co., such as Product Engineering, Design Engineering, Production, and Quality Control, but also of a number of cooperating companies. This total program emphasized dramatically the importance and the value of the close cooperation of technical groups of the several industries that must ultimately be involved. It also emphasized the importance of complete confidence in exchange of data in reaching ultimate success.

The companies which worked with Eastman Kodak on this project included: Reliance Varnish Co., Louisville, Ky., suppliers of the finish; The R. C. Mahon Co., Detroit, Mich., producers of dipping and baking equipment; Lester-Phoenix, Inc., Cleveland, Ohio, manufacturers of the injection molding machine; Tennessee Eastman Co., Kingsport, Tenn., suppliers of Tenite II; Consolidated Vacuum Corp. (formerly Vacuum Equipment Div., Distillation Products Industries), Pasadena, Calif., manufacturers of metallizing equipment.

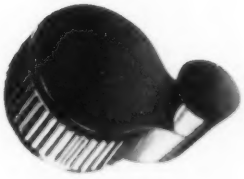
To date, sales records indicate that this new reflector for the Kodak Duaflex camera has proved extremely popular. Its attractiveness, combined with its structural and photographic advantages, create strong sales appeal to consumers.

setting a new standard



Standard control knobs by Raytheon for the electronics field are now rapidly molded of chipproof Tenite plastic in a wide range of sizes and styles.

For these new knobs Tenite provides characteristic pleasant feel, *plus* exceptional toughness. Its uniform texture permits a lasting lustrous or matte finish, permanently free of rust or corrosion.



Tenite is also a standard choice for many other applications which meet the hands of the public—such as appliance housings, pen and pencil barrels, tool and cutlery handles. This dependably durable material comes in more than 25,000 color effects, and can be readily molded or extruded to close dimensions.

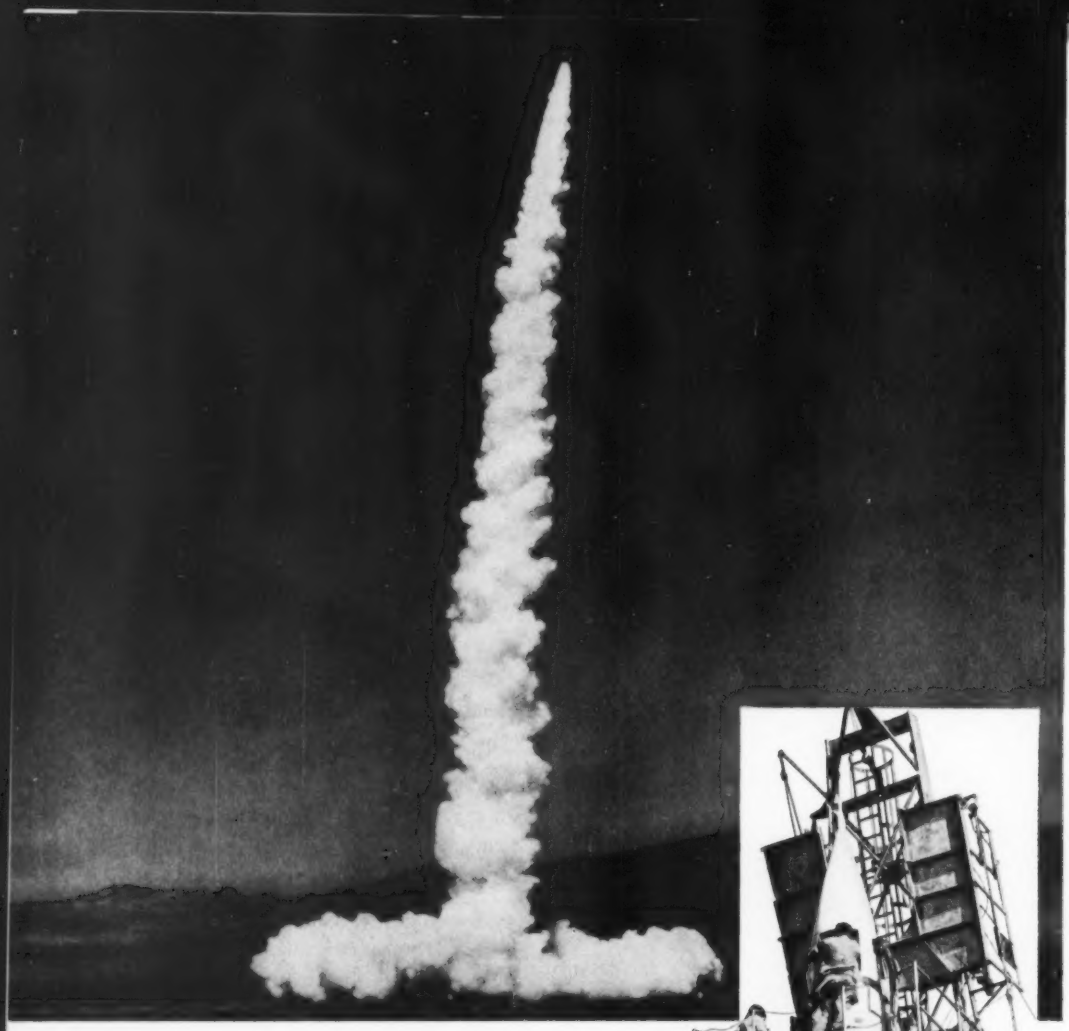
Standard control knobs produced by Raytheon Manufacturing Company, Waltham, Mass.; molded by The Bolta Company, Lawrence, Mass.

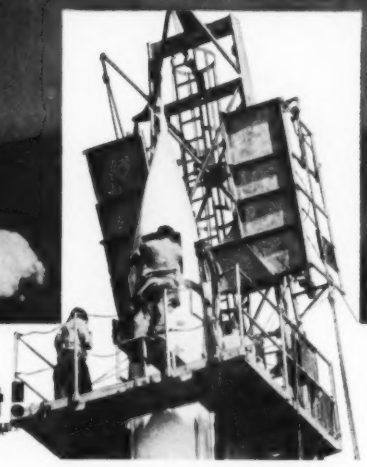
For more information about the properties and uses of Tenite, write EASTMAN CHEMICAL PRODUCTS, INC., Kingsport, Tennessee, Sales Representative for Tennessee Eastman Company, Division of Eastman Kodak Company.

● Information regarding Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Houston, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, and Seattle; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

TENITE

an Eastman plastic





WHEN NEEDED . . . a specialist!

Only the meeting of dozens of specialist minds has made this 250 mile rocket flight possible.

For want of specialists, many a fine product would never rise to success. That's why you'll find at Marblette one of America's ablest group of men—specialists in phenolic resins. Around these men, for over a ¼ of a century, Marblette has built up the special equipment specialists must have. Only thus has it become possible to give you the special formulation in each liquid phenolic resin necessary to meet *your* special production requirements and marketing problems.

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And Marblette's Wood Coating Resin (No. 400)—a tough plastic coating of high lustre, resistant to chemicals, solvents and temperature extremes; possesses great depth and clarity, bringing out the full beauty of the wood. Sets at room temperature. Especially recommended for industrial wood surfaces, patterns, furniture, bar tops, home floors, gymnasium floors, freezers, sporting goods, etc.

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Laminating varnish • Wood coating • Plastic cements
Metal coating • Insulating varnish • Sealing resins

PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

Glazing of Aircraft†

by E. W. Russell††

THIS discussion will be limited to plastic optical transparencies, with only an initial passing reference to the alternative material, laminated glass. Toughened laminated glass can only be produced in a limited range of curvatures; therefore, it is suitable only for components consisting of relatively small panels supported in a metal framework. Restriction of the field of view by such a framework is unacceptable for fighter aircraft in which all-round vision is of first importance; for this reason alone glass is considered unsuitable for canopies.

Brief mention may be made of some of the problems that arise in the use of laminated glass windshields. These include problems of a mechanical character, chiefly those of vulnerability either to enemy attack or to hailstone or bird impact; the limitations of the materials in these directions are becoming understood. The use through such windshields of precision optical instruments, especially with panels inclined to the line of sight at large angles, is imposing rigid manufacturing tolerances. Thermal problems connected with the maintenance of clear vision under all conditions of flight also engage much attention, including various thermal methods of demisting and defrosting. Steep temperature gradients set up in the material during rapid climb can produce severe stresses and a tendency for the panel to bow.

It was thought that by including acrylic laminations in a bullet proof windshield some weight saving might be achieved. As might be expected a simple unsymmetrical sandwich of glass and acrylic laminated with polyvinyl butyral shattered at low temperatures due to differential contraction. Symmetrical panels were undamaged when subjected to a uniform low temperature, but under temperature gradients noticeable curvature of the faces occurred with, in some cases, fracture of the glass. Curvature of the order obtained is unacceptable optically even though fracture may be avoided.

Organic Transparencies

Turning now to the properties of the organic transparencies, we find that an already difficult problem is seriously aggravated by the rapidly improving performance of the aircraft concerned. Gardner (1)[1] has emphasized that "the need for a transparency which is nearer a structural material grows greater as speeds increase," and that "considerations of the future use of the transparencies in supersonic aircraft are particularly alarming." The trend towards greater operating altitudes has increased the demand for adequate structural behavior and has raised the hazard to the crew in the event of failure. The fundamental material problem lies in the fragile nature or lack of toughness of the substances available. Briefly reiterating their

* Reg. U.S. Pat. Off.
† This paper was delivered at the 1952 AIA-ARDC Transparent Materials Conference at the Engineers' Club, Dayton, Ohio.
†† Royal Aircraft Establishment, South Farnborough, England.

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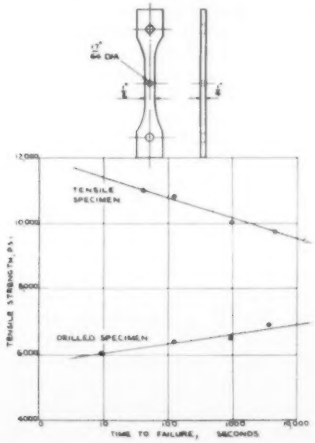
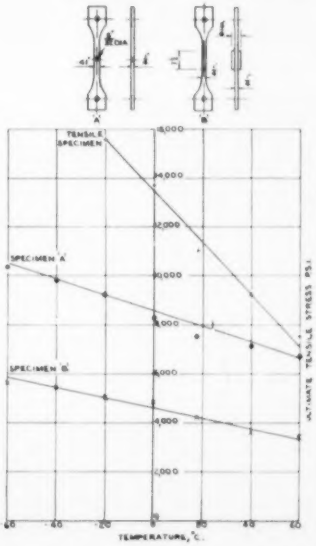


Fig. 2—Effect of stress raisers on the variation of tensile strength of plasticized Perspex with temperature



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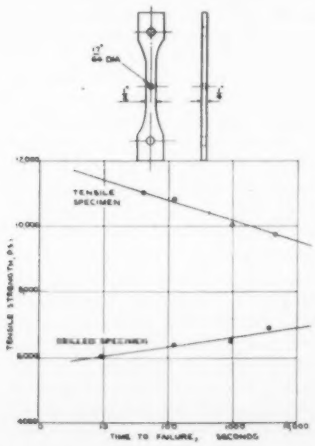

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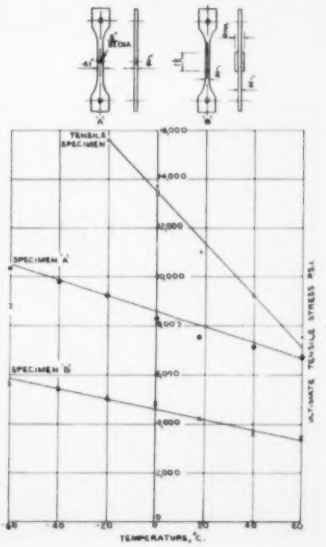


shortcomings, they are notch sensitive, have low resistance to crack propagation, and at elevated temperatures they soften and have inferior strength properties. Because of their basically liquid-like structure, they have high coefficients of expansion. In addition, polymethyl methacrylate, the material still in universal use in the Royal Air Force either in the plasticized or unplasticized forms, has the objectionable propensity of crazing.

Two questions arise as a result of all these considerations. First—what can be done as an interim measure to improve the methods in which the present material is used? And second—in what ways can one hope to develop materials of better properties? Some answers which have been suggested to the first question will be considered and then, rather more briefly, the second will be discussed. The probability should be borne in mind that to a great extent improvements in present usage are likely to be of permanent value as newer materials come to light. Some at least of the undesirable properties mentioned are likely to remain; it seems too much to hope otherwise. In fact some additional sacrifices will probably have to be made in some directions to secure more necessary improvements in others.

Canopy Strength

In the first place the question of the strength of an acrylic canopy may be considered. Ideally, one might calculate the tension produced in the shell under the influence of an applied differential pressure from a knowledge of the radii of curvature. For a given thickness of material the bursting pressure should be reached when the tension per unit thickness reaches the value of the tensile strength. In actual experiment the average bursting strength of typical fighter canopies made from ⅜-in.-thick "Perspex"[2] is about 15 p.s.i. at 20° C. instead of a calculated value of about 225 p.s.i. Expressing this in an alternative way an ideal canopy having the same superficial dimensions but only 1/10 in. thick should sustain the same pressure. This example is given to show the low efficiency with which our material is used in typical structures; in this case less than 7 percent.

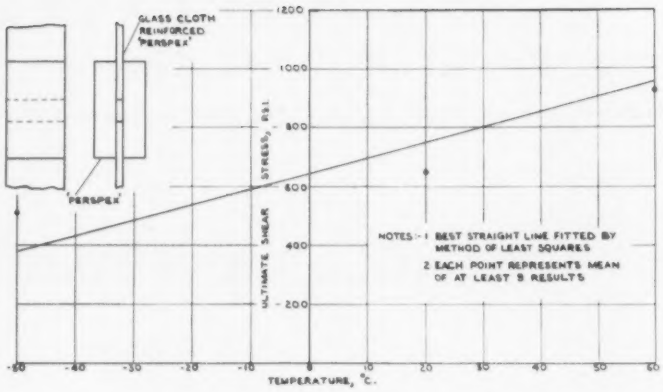
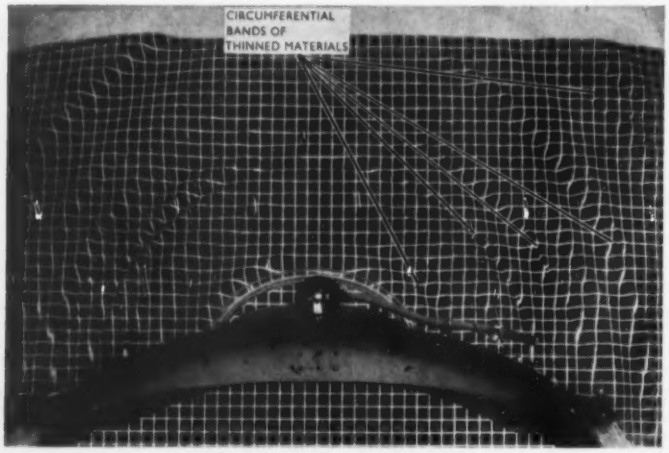


Fig. 3—Variation with temperature of the shear strength of joints between unplasticized Perspex and I.C.I. glass cloth laminate

Not only is the mean strength of a canopy low in terms of the strength of the material used, but for nominally identical components it varies greatly; the range of variation probably differs from one type to another. An attempt to estimate this variation has been made as follows: The results of proof tests during production of 900 canopies of one type suggest a coefficient of variation (V) of strength of about 22% for this particular design. Since the mean strength is not accurately known, this figure is only an estimate. Tests to destruction on 22 canopies of one type and 26 of another give values of 29 and 34%, respectively. In neither case can the number of specimens tested be regarded as sufficient to give a reliable measure of the scatter. In addition the design which gave the value of 34% is not representative of modern practice. With these reservations it seems reasonable to conclude that the coefficient of variation of strength for a typical fighter canopy is about 25%. Such a high value necessarily makes it difficult to ensure absolute reliability for the service. From statistical tables (2) it is found that for this value of V one canopy in 40 has a strength less than half the mean

[2] "Perspex" is the trade name of the acrylic resin manufactured by Imperial Chemical Industries, Ltd.

Fig. 4—Optical distortions caused by variation of thickness in a stretch-molded canopy



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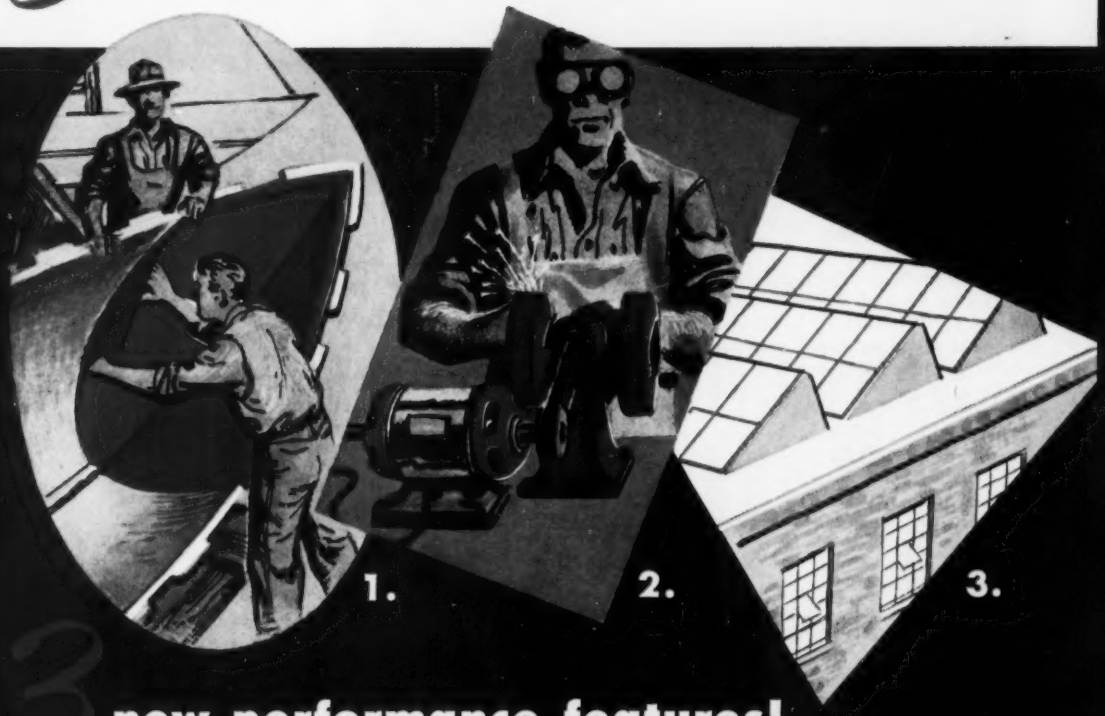

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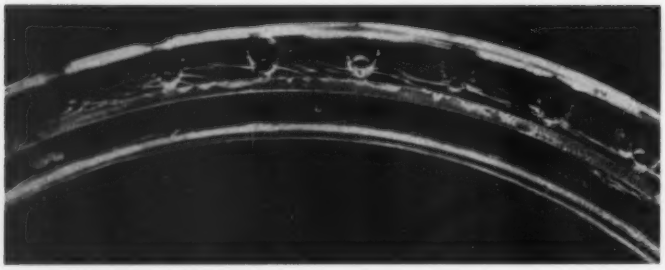

Fig. 5—Crazing in a cabin window due to inaccurate fitting of window and frame

value and one in 1000 less than a quarter of the mean.

For tensile tests values of the coefficient of variation on sheets as received are of the order 5 to 7% and on specially heat-treated material may for a given sheet be less than 1 percent. Including sheet to sheet variations very low values are still observed. The difference between these values and the 25% on the canopy strength is a measure of the difficulty of using this brittle notch-sensitive material as a load-carrying structure.

Failure Points

Thus two problems have to be considered: the low strength attained in practice and the wide scatter observed on that strength. Each of these holds out hope of useful improvement.

Stress concentrations within the canopy especially at its edge attachments are practically unavoidable, and it is usually at these points that failure occurs. Some experiments on the effect of stress raisers on the tensile strength are pertinent. Figure 1 compares the results obtained for ordinary tensile specimens with those for a simple dumb-bell specimen with a drilled hole as illustrated. Each point represents the mean of 15 determinations and the straight lines were fitted by the method of least squares. As might be expected, the notch sensitivity increased with increasing rate of loading; at the slower rate stress relief can occur at the hole. The increase with rate of loading is sufficient to reverse the normal upward trend of the ultimate tensile strength such as is obtained with simple tensile test pieces.

Figure 2 shows the effect of temperature on notch sensitivity. In both types of test piece shown the effect of the stress concentration is lower than in the earlier experiments. The effect of the stress raisers was simply to reduce the rate of increase of ultimate tensile stress with decrease of temperature. The values obtained with simple tensile specimens are higher than those normally obtained.

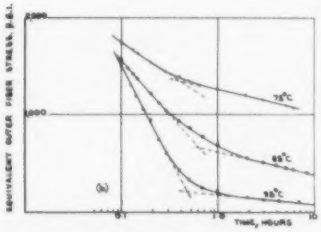

Fig. 6—Effect of temperature on the relaxation of stress in unplasticized Perspex at constant deformation

This resulted from the high rate of loading—about 100 p.s.i./sec.—used in these experiments. The behavior of similar specimens at lower rates of loading is being examined, but preliminary results confirm the conclusions. In this case also the mean of 15 specimens is given at each point, and the least squares method used to fit the best straight line assuming correct temperature readings. In each case the tensile strength was calculated on the minimum initial cross sectional area.

Figure 3 illustrates the effect of high stress concentrations such as may occur in shear at the edges of glass cloth laminate reinforcement. The test piece used is illustrated on the figure. In this case the strength of the joint decreased with decrease in temperature.

Mention may briefly be made of some experiments on cemented shear strips. Heat treatment of the specimens lowered the breaking stress of both single and double shear strip forms. The cement used was of the solvent type and it is thought that dispersal of residual solvent during the heating process accentuated stress concentration effects.

Returning to the question of variability, it is found that if specimens are prepared with reasonable care the coefficient of variation of strength is not seriously increased by the presence of the stress-raiser. Hence, the important conclusion is reached that while the effect of stress raisers is to lower the overall strength attained by a canopy they do not satisfactorily account for the increased scatter observed. It is further concluded that much of the wide variation of canopy strength is caused by variations introduced during manufacture.

From all these considerations it is evident that improvements both in design and in methods of fabrication are needed. In design the best choice of canopy shape to minimize stress and distortion, proper mounting in a chassis of adequate stiffness, and effective edge attachments of the plastic to the metal are suggested lines of advance. In particular, adequate

Fig. 7—Crazing at a cemented joint

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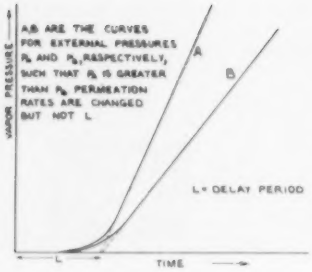

A,B ARE THE CURVES FOR EXTERNAL PRESSURES P_A AND P_B, RESPECTIVELY, SUCH THAT P_A IS GREATER THAN P_B. PERMEATION RATES ARE CHANGED BUT NOT L
VAPOR PRESSURE
A
B
L = DELAY PERIOD
L
TIME

Fig. 8—Rate of increase in pressure of aqueous vapor in an enclosed space on an unplasticized Perspex sheet with constant vapor pressures on other face

allowances for thermal contraction and for the proper distribution of load during such movement are highly important. Methods of fabrication aimed at greater control of the process and greater reliability of the product are worthy of study. Figure 4 is a photograph taken through an acrylic canopy of a uniform grid of black lines on a white ground. It shows the thinning caused by severe local stretching by hand over a male former. It is not regarded as typical of its kind; it was in fact a reject, but it illustrates in a highly exaggerated way the type of variations that may occur. Figure 5 indicates the effect of stress raisers in producing local crazing at the rebated edge of a cabin window.

Heat Treatment

It is now the British practice to heat treat under officially specified conditions all flat sheet which is to be used as such as a stress-carrying part of an aircraft. Entire canopies are annealed as far as possible complete with their final attachments. There are several purposes in these treatments. The susceptibility of the panels to crazing is reduced by the removal of stress and by completing polymerization, incidentally increasing the resistance to solvents. The general stress level induced in shapings during manufacture and mounting is lowered and solvent from cements is dispersed throughout a larger volume of the material; polymerization of monomer-containing cements is also completed. Preheated clean air is blown through the interspaces of double shell canopies to remove vapor.

Figure 6 shows the relaxation of stress that is observed in polymethyl methacrylate beams held at a constant deflection at three different temperatures. After an initial rapid linear fall in stress, the curve passes over into a much slower linear fall. The point of intersection of the two linear parts is regarded as that applied stress which is required to depress the second order transition temperature of the material to the value indicated on the curve. Extrapolation to zero stress of the

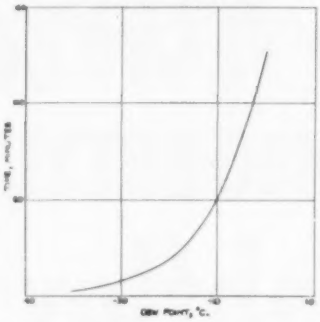


Fig. 9—Curve shows time for dry sandwich to reach given dew points

values obtained gives reasonable agreement with the value determined dilatometrically. The values shown assume that a linear stress gradient is maintained in the sample. This, of course, is incorrect and the surface stresses will be lower than those calculated. However, since the attainment of low surface stresses is of prime importance in avoiding crazing (3), the figures given represent the worst case. Noting that the time is on a log scale it will be seen that little advantage accrues in greatly lengthening the time of annealing. For a large component, adequate additional time must, of course, be allowed for thermal equilibrium to be reached. For plasticized acrylic a temperature of 65 to 70° C. is specified and for the heat-resistant grade 84 to 87° C.

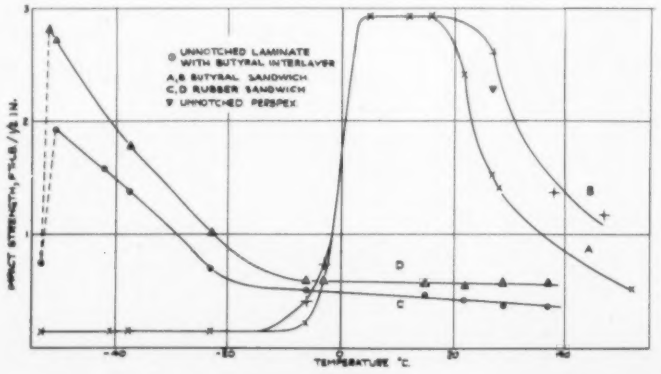
Value of Annealing

Early experience in the annealing of complete canopies soon showed its value. In a series of high-temperature loading tests on canopies the annealing reduced to a marked extent the rate of failure under subsequent proof-loading from the high percentage obtained without it. Some manufacturers have carried the process to the limit and anneal at each major stage of production.

In cemented joints crazing still presents a serious problem on occasions (Fig. 7). A careful examination of such systems leads to the conclusion that the crazing must have developed during assembly. The parts of such an assembly no longer matched when cut along the glue line; the crazing was too close to the neutral axis for sufficient stress to be developed in bending to produce it. With inaccurately mating surfaces one is put under tensile stress by force fitting it to the other, and crazing occurs under the influence of solvent or monomer in the cement. The mating surfaces may be made to fit accurately by assembling the parts dry and annealing while clamped together in a jig.

(*Continued on p. 180*)

Fig. 10—Izod impact strength of Perspex laminates (notched specimens)



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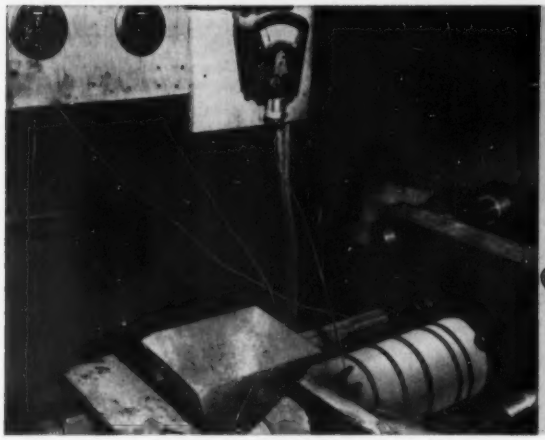

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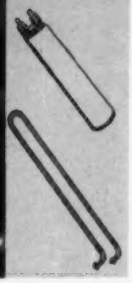
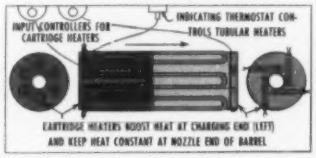
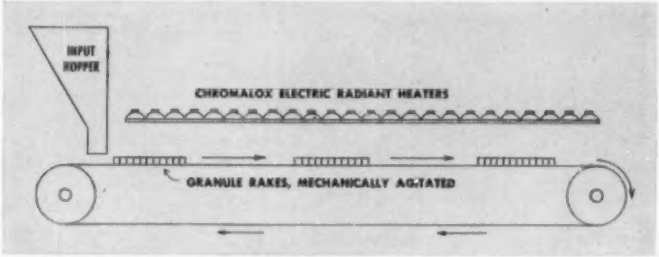


"ZONED" HEAT ANSWERS CRITICAL PROBLEM

Zones of heat, that are controlled easily and exactly to meet the molding characteristics of nylon just "come naturally" when Chromalox Electric Heaters are the heat source. Six thermostatically controlled Chromalox Tubular Heaters, clamped around the barrel, uniformly heat its entire length. Six Chromalox Cartridge Heaters inserted at the feed end act as booster heaters to liquefy the charge. Four Cartridge Heaters keep temperatures at the required levels in the nozzle. Each set of cartridge heaters is controlled by a Chromalox Input Controller; while an indicating thermostat controls the tubular heaters. Heat is regulated to the exact temperatures required for every mold size. Optimum operating heats are easily redialed when needed.

Diagram below illustrates the 3 heat zones, each controlled individually.


INPUT CONTROLLERS FOR CARTRIDGE HEATERS
INDICATING THERMOSTAT CONTROLS TUBULAR HEATERS
CARTRIDGE HEATERS BOOST HEAT AT CHARGING END (LEFT) AND KEEP HEAT CONSTANT AT NOZZLE END OF BARREL

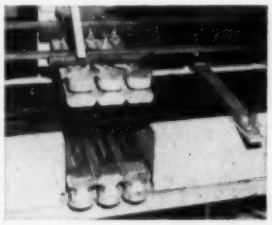


DRYING PLASTIC GRANULES SPEEDILY AND UNIFORMLY

One plant's solution for drying granules was this conveyorized set-up which dries the granules enroute from hopper to barrel. Chromalox Radiant Heaters are "color-blind;" their *far*-infrared energy is absorbed almost equally fast by all colors. Radiation is uniform; output is regulated easily to avoid overheating and sticking.

HOW PLASTIC RODS ARE BENT QUICKLY, EASILY, ECONOMICALLY

A table was built (photo A), with Chromalox Electric Radiant Heaters positioned above and below the portions of the rods to be heated. A forming press (photo B) was built to form the rods. About 30 rods, clamped together for efficient handling, are heated and formed at one time.



A—Concentrated *far*-infrared heat is absorbed efficiently and rapidly by plastic rods of all colors.

B—Forming jig bends heated rods quickly, was made in company's own shop.

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Heat Loss Through Acrylic Glazing*

ACRYLIC sheet is being increasingly specified for industrial glazing in high-breakage areas and where corrosive atmospheres make the maintenance of steel sash excessively costly. In such plants, heat loss through the plastic window area must be determined before plant heating requirements can be accurately calculated. The thermal conductivity of the plastic, therefore, must be known to the designer before he can determine the heat loss through the windows. Charts and graphs are presented in this paper from which the heating and ventilating engineer can determine the over-all coefficient for windows glazed with acrylic panels.

Calculating Heat Transfer

The complete expression for the rate of heat flow from one air volume through an acrylic panel to a second air volume is as follows:

$$Q = UA\ (T_2 - T_1)$$

where Q = Total heat loss in Btu/hr.,

A = Area of panel in sq. ft.,

T_1 = Temperature of air on one side in ° F.,

T_2 = Temperature of air on second side in ° F., and

U = Over-all coefficient of heat transfer in Btu/hr. sq. ft. ° F.

The nomograph in Fig. 1 can be used to determine the coefficient U. To use the chart, locate the air velocities at each surface of the panel on scales (1) and (2); then locate the point on scale (3) that is determined by the intersection of a straight line drawn between the chosen points on scales (1) and (2) of the nomograph. This point of scale (3) is then lined up with the point on scale (4) corresponding to the sheet thickness and the coefficient is read from scale (5). Multiplying this coefficient by the temperature difference (in ° F.) between the air of each surface and by the area (in sq. ft.) will give the number of

Fig. 1—Alignment chart for determination of heat flow through Plexiglas panels from air to panel to air at different air velocities

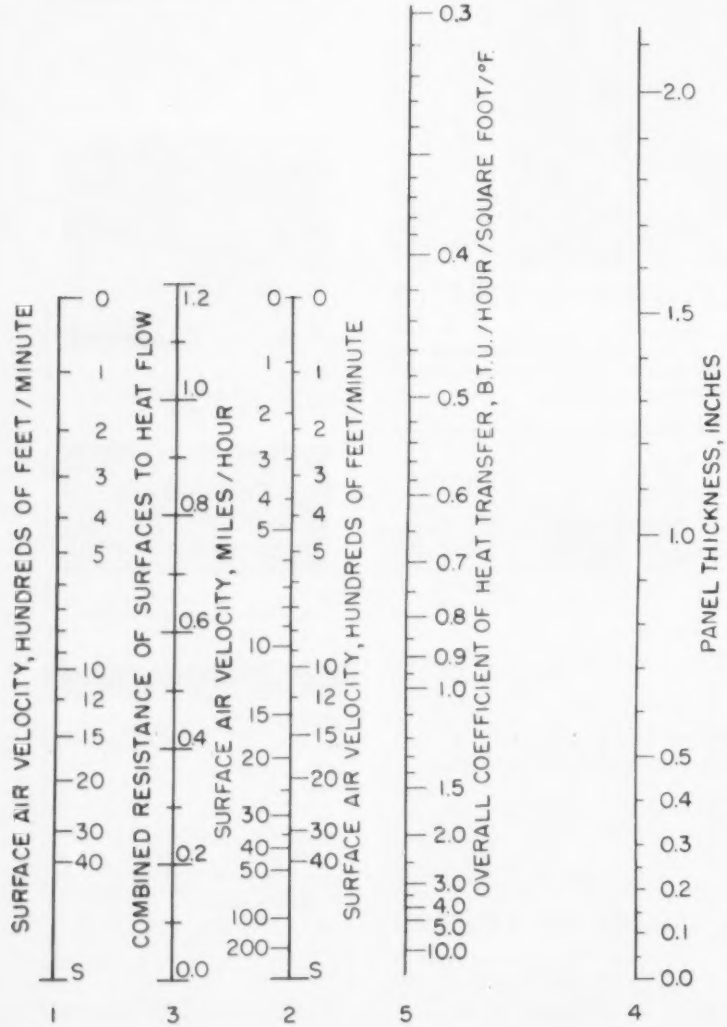
SURFACE AIR VELOCITY, HUNDREDS OF FEET / MINUTE
COMBINED RESISTANCE OF SURFACES TO HEAT FLOW
SURFACE AIR VELOCITY, MILES / HOUR
SURFACE AIR VELOCITY, HUNDREDS OF FEET/MINUTE
OVERALL COEFFICIENT OF HEAT TRANSFER, B.T.U. / HOUR / SQUARE FOOT / °F.
PANEL THICKNESS, INCHES
1
3
2
5
4

Table I—Coefficient of Thermal Conductivity (k) of Plexiglas I-A

Mean Temperature of Measurement	*Coefficient k Btu/ (hr.) (sq. ft.) (°F./in.)*
86° F. (30° C.)	1.32
54.5° F. (12.5° C.)	1.37
9.5° F. (—12.5° C.)	1.44

* Contribution from the Physics Laboratory, Rohm and Haas Co.

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Btu's transferred through the panel per hour under given conditions.

Example

Problem—What is the rate of heat loss from a 0.125 in. thick Plexiglas window with zero (0) air velocity (convection) on the inside and a 20 m.p.h. wind on the outside, the air temperature difference being 60° F. and the area of the window 12 sq. feet.

Solution—Lay a straight edge between the zero (0) mark on scale (1) and the 20 m.p.h. mark on scale (2) intercepting scale (3) at 0.77. Then lay the straight edge from this point on scale (3) to the 0.125-in. mark on scale (4). The coefficient 1.15 is read from scale (5). The rate of heat loss can then be calculated as $1.15 \times 60 \times 12 = 830$ Btu/hour.

The over-all coefficient of heat transfer (U) through an acrylic panel (Fig. 2) can be calculated as follows:

$$1/U = L/k + 1/h_1 + 1/h_2$$

where L = Thickness of acrylic sheet in inches,

k = Coefficient of thermal conductivity of the material, Btu/(hr.) (sq. ft.) (° F./in.),

h_1 = Interfacial coefficient on one side of panel, Btu/(hr.) (sq. ft.) (° F.), and

h_2 = Interfacial coefficient on other side of panel.

The coefficient of thermal conductivity (k) of Plexiglas I-A has been determined by the Ceno-Fitch method shown in Table I on page 126. The thermal conductivity of some other acrylics approximates these values closely enough for practical applications.

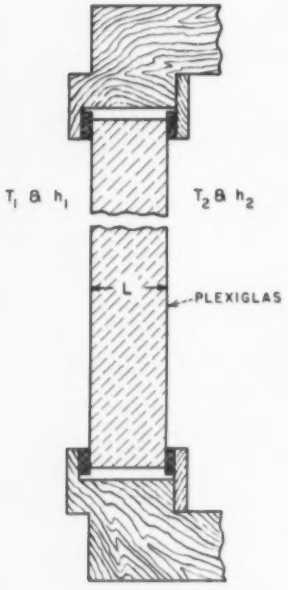


Fig. 2—Sketch of window with acrylic glazing

Fig. 3—Air-Plexiglas interfacial coefficient of heat transfer versus air speed at 32° F. (0° C.) air temperature

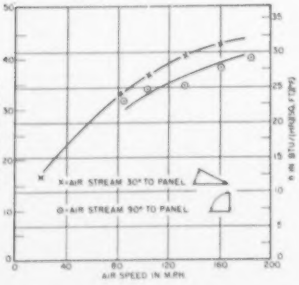
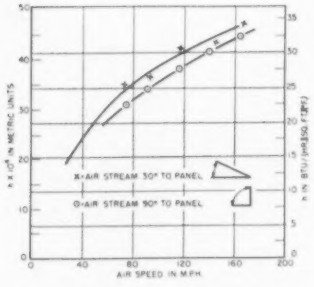


Fig. 4—Air-Plexiglas interfacial coefficient of heat transfer versus air speed at −13° F. (−25° C.) air temperature



Faster Air Streams

The interfacial coefficients (h_1 and h_2) are 1.7 for still air and 6.0 for air moving at 15 m.p.h. Interfacial coefficients for applications where air streams are moving faster than 15 m.p.h. can be determined from Figs. 3, 4, and 5. The three graphs are plotted individually to show values for air at 32° F. (0° C.), −13° F. (−25° C.), and −58° F. (−50° C.).

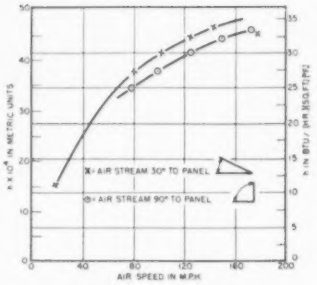


Fig. 5—Air-Plexiglas interfacial coefficient of heat transfer versus air speed at −58° F. (−50° C.) air temperature

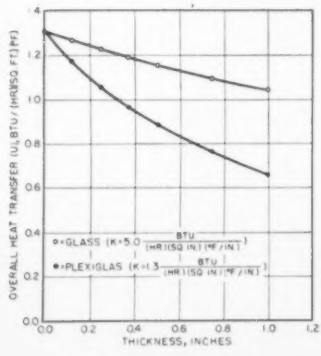
Coefficient values for air stream angles of incidence of 30° and 90° are plotted for each air temperature.

To show the heat saving qualities that can be expected from windows of acrylic panels, Figs. 6, 7, and 8 give the coefficient of heat transfer for comparable thicknesses of acrylic plastic and glass. The comparisons in these graphs are made under standard conditions of the American Society of Heating and Ventilating Engineers, −0 velocity and 70° F. on one side, and 15 m.p.h. air speed and 0° F. on the opposite side. Single panel Plexiglas shows about 4½% less heat loss than glass in 0.060-in. thickness (Fig. 6). This advantage increases to approximately 15% at 0.25-in. thickness, and 37½% at 1-in. thickness.

Increased resistance to heat loss

(*Continued on page 185*)

Fig. 6—Calculated heat transfer through single panels with 15 m.p.h., 0° F., air on one side and 0 m.p.h, 70° F. air on the other side versus panel thickness



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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

CELLOPHANE. G. C. Inskeep and P. Van Horn. Ind. Eng. Chem. *44*, 2511-24 (Nov. 1952). Cellophane was first manufactured in the United States in 1924 at an annual rate of 500,000 lb.; production last year approached 300,000,000 lb. There are now three companies producing cellophane in the United States. Pioneer was E. I. du Pont de Nemours & Co., Inc., whose newest plant at Clinton, Iowa, is a model of sound chemical engineering design, coupled with process efficiency and safe operations. In the Clinton plant, bleached sulfite wood pulp is steeped in caustic and xanthated with carbon disulfide to form a viscose superficially similar to, although really quite different from, that used for rayon manufacture. The viscose is formed into sheets on 16 casting machines. Most of the production is then coated in specially designed coating towers. The cellulose film business has always been highly competitive with waxed paper, glassine, and other materials entering the flexible packaging market. The competition has spurred intensive research effort to improve the product and achieve process economies, as well as to develop new fields for its use. There are today about 130 varieties of cellophane made by Du Pont to satisfy the many facets of the packaging industry and other applications. The industry has accelerated the development of automatic packaging machinery and pioneered in originating new retail marketing techniques.

EXPANDED PLASTICS. Chem. Week *71*, 32-6 (Dec. 20, 1952). The production of expanded plastics is surveyed.

BRITISH PLASTICS FOR THE WORLD. Brit. Plastics *25*, 314-39 (Oct. 1952). The export trade of Great Britain with respect to plastics is discussed in detail. Subjects considered include competition with the United States of America and Germany, and the import status of other nations. Data for each country are presented. A list of British export agents in various countries is given.

PHENOL PROCESSES. J. M. Weiss. Chem. Eng. News *30*, 4714-17 (Nov. 10, 1952). Processes and statistics in phenol production are discussed.

Materials

RESIN-FORMING REACTIONS OF FURFURAL AND PHENOL. L. H. Brown. Ind. Eng. Chem. *44*, 2673-5 (Nov. 1952). The effects of variables such as amount and kind of catalyst, amount of water, and reactant ratios on the furfural-phenol reaction are described in terms of yield and properties of the resulting resins. In the presence of water, large quantities of sodium hydroxide catalyst are required to get a rapid reaction. In the absence of water, mild catalysts such as alkali carbonates are effective. One-stage resins are obtained with high ratios of furfural to phenol in aqueous media. Novolak resins are obtained with low furfural-phenol ratios under relatively anhydrous conditions. Intermediate types also are described. Most of the resins obtainable with phenol and formaldehyde have been duplicated with furfural. Some of the novolaks described are soluble in drying oils. Any of the novolaks may be thermoset with acids without additional aldehyde.

PROPERTIES AND APPLICATIONS OF POLYETHYLENE. H. F. Robertson. SPE J. *8*, 8-12, 26 (Sept. 1952). The history, manufacture, properties, fabrication, calendering, molding, and applications of polyethylene are reviewed. 11 references.

LINEAR POLYPHOSPHATES. H. Zentfman and H. R. Wright. Brit. Plastics *25*, 374-6 (Nov. 1952). A recently developed group of linear aromatic polyphosphates known as Phoryl resins are chemically similar to the monomeric esters, and have the useful characteristics associated with linear polymers. The preparation and properties of Phoryl resins are described. Possible applications in the adhesive, paint and protective coating fields are discussed.

NEW EXPANDED PLASTICS. Plastics (London) *17*, 313 (Nov. 1952). Honeycomb materials made of polyethylene and rigid polyvinyl chloride similar to the type made of metal and paper are described.

SILICONE RUBBER FOR MECHANICAL COMPONENTS. A. E. Javitz. Elec. Manuf. *50*, 142-7, 314, 316, 318 (Nov. 1952). The properties of silicone rubbers are reviewed, with particular emphasis on those concerned with mechanical applications. These materials have excellent stability in mechanical properties over a wide temperature range, —100° F. to 500° F. Specific applications given.

CORRELATION BETWEEN PROPERTIES OF ALKYDS AND COMPOSITION OF MODIFYING FATTY ACIDS. D. T. Moore. Ind. Eng. Chem. *44*, 2676-8 (Nov. 1952). The drying rate of alkyds is inversely proportional to the oil-resin ratio, except that at very small oil-resin ratios the apparent drying rate is misleading and the time for real hardening again increases. As the oil-resin ratio decreases, the hardness of the alkyd film rises to a maximum and then decreases to somewhat lower values. The degree of afteryellowing of the pigmented alkyd film is related to the oil-resin ratio but appears to approach a limiting value as the oil-resin ratio increases.

Applications

PLASTICS AID IN CONSERVATION OF OLD PAINTINGS. A. E. A. Werner. Brit. Plastics *25*, 363-66 (Nov. 1952). The types of plastics and adhesives being used at the National Gallery in London to preserve and mount old paintings are described in detail. The materials include polyvinyl acetate, polybutyl methacrylate, and epoxy resins.

RESEARCH PROGRESS IN DIELECTRICS – 1952. A. E. Javitz. Elec. Manuf. *50*, 109-15, 336, 338, 340, 342 (Dec. 1952). The papers presented at the 1952 NRC Conference on Electrical Insulation are reviewed. The topics considered included Class H insula-

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tion, the causes and mechanisms of the degradation of dielectric materials, the effects of radiation, and new developments in ferromagnetics and ferroelectrics.

USE OF SILICONE WATER-REPELLENTS IN THE LABORATORY. P. T. Gilbert, Jr. Chemist Analyst *41*, 52-7 (Sept. 1952). The applications of silicone polymers as water-repellent coatings for laboratory equipment, particularly glassware, are described. 12 references.

GUARANTEED QUALITY OF PVC SHEET GIVES CONFIDENCE. Brit. Plastics *25*, 360-2, 392 (Nov. 1952). Raincoats and cloaks made of polyvinyl chloride sheet are described.

BOATS OF GLASS FIBER LAMINATES. Plastics (London) *17*, 253-4 (Sept. 1952). Twelve-foot dinghies are now being produced in a Weymouth shipyard by a no-pressure molding system using glass fiber mat bonded with cold-setting polyester resin. The method of manufacture is described and further applications of the materials and techniques employed are indicated.

PLASTICS IN THE SERVICE OF MAN. 31. RAILWAYS. Plastics (London) *17*, 260-63, 270 (Sept. 1952). 28 illustrations of the applications of plastics by the British Railways are herein presented.

ELECTRICAL NOISE FROM INSTRUMENT CABLES SUBJECT TO SHOCK AND VIBRATION. T. A. Perls, J. Applied Phys. *23*, 674 (June 1952). A noise-free electrical cable is made by applying a plastic coating containing graphite to the inside of the tube of insulation between the tubing and the metal conductor.

Properties

ACCELERATED AND OUTDOOR WEATHERING OF COLORED VINYL FILMS. F. G. Clark. Ind. Eng. Chem. *44*, 2697-2709 (Nov. 1952). Commercial carbon arc light units are often used to predict outdoor behavior of colored polyvinyl chloride compositions. A study of 25 films under 12 outdoor conditions and in two accelerated machines, Fade-Ometer and X1A Weather-Ometer, was made. In New Jersey it required 2.8 winter sun hours and in Florida 1.6 winter sun hours to equal 1.0 sun hour in summer, which showed Florida to be more consistent the year round. With a window glass covering, 40%

longer than with direct exposures was required to reach the same degree of degradation. A temperature rise of about 10° C., resulting from the use of a black background, increased rate of decomposition by 40% but the rate of fading of colors by only 10% on the outdoor test. On the average 1.5 hours in the Fade-Ometer were required to equal 1.0 hour in the X1A unit for fading of colors, but there were marked deviations. The X1A Weather-Ometer decomposed compounds at the same rate as it faded colors, while the Fade-Ometer decomposed compounds 1.9 times as fast as it faded. Hence, the X1A unit was concluded to be the more reliable. Although there is a statistical correlation of results in the X1A unit with outdoor results, there are wide exceptions which make the outdoor test indispensable. The limitations of the accelerated units must be kept in mind if gross errors are to be avoided.

BONDING OF THIN FILMS. H. P. Meissner and J. Byrne. J. Applied Phys. 23, 1170-73 (Oct. 1952). Unsupported films of cellulose nitrate of 0.25 mil. and less in thickness bond immediately and spontaneously in air to solid surfaces which they are made to touch. Bond strength increases with diminishing film thickness. Similar behavior is shown by films of gold, regenerated cellulose, polymethyl methacrylate, and gelatin.

CALORIMETRIC PROPERTIES OF POLYTETRAFLUOROETHYLENE (TEFLON) FROM 0° TO 365° K. G. T. Furukawa, R. E. McCoskey, and G. J. King. J. Research National Bureau Standards 49, 273-8 (Oct. 1952). The thermal properties of polytetrafluoroethylene (Teflon) samples were investigated, using an adiabatic-vacuum calorimeter. The effect of the annealing and quenching processes on the heat capacity of a molded Teflon sample was studied. The heat-capacity data were used to compute the heat capacity, enthalpy, and entropy of the polymer samples at 5-deg intervals from 0° to 365° K. The heat-capacity results with the molded, annealed, and quenched samples of Teflon show the possibility of a glass transformation at about 160° K. The lack of a more definite glass-transformation effect is attributed to inter- and intra-molecu-

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lar hindrances to configurational changes in the Teflon polymer. The existence of first-order transitions ot 293° and 303° K., previously reported by Quinn, Roberts, and Work, was confirmed.

RATIO OF TENSILE STRENGTH TO MELT VISCOSITY FOR HIGH POLYMERIC MATERIALS. R. F. Boyer. J. Polymer Sci. *9*, 289-94 (Oct. 1952). The ratio of tensile strength of a polymer at 25° C. to its melt viscosity at some elevated temperature in the fabrication range is suggested as a quantitative figure of merit for commercial polymers. This ratio goes through a very sharp maximum as a function of molecular weight. The height of the maximum drops sharply with increasing molecular weight heterogenity, although the location of the maximum along the molecular weight scale is unchanged. This behavior follows because tensile strength depends on number-average, and melt viscosity on weight-average molecular weight. The possible role of non-Newtonian behavior on these conclusions is discussed. Finally, it is shown that the ratio of tensile strength to melt viscosity for a plasticized polymer increases exponentially with plasticizer content.

ABRASION OF RUBBER BY A NEEDLE. A. Schallamach. J. Polymer Sci. *9*, 385-404 (Nov. 1952). A detailed study was made of the scratches produced by a needle on natural rubber vulcanizates of different composition. The surface damage brought about in this way depends markedly on the nature of the rubber. In particular, the traces on unloaded vulcanizates are discontinuous whereas the traces on carbon loaded rubbers of the tire tread type are continuous. It is possible to explain the results qualitatively by reference to hardness, friction, and tear resistance of the vulcanizates.

Molding and Fabricating

DRY COLORING OF POLYSTYRENE. Plastics (London) *17*, 257-8 (Sept. 1952). The technique for dry coloring polystyrene molding compounds is described in detail. A list of colorants with recommended amounts for use is given.

SILK SCREEN PRINTING ON PLASTICS. Plastics (London) *17*, 267-8 (Sept. 1952). Decoration or printing on an article manufactured from plastics can often enhance its value and increase sales appeal. In many cases where plastics are used, e.g., scales, dials, notices, and display signs, clear and accurate printing is one of the major requirements. Many techniques have been developed for printing on plastics and one of the most versatile processes in use is the method of silk screen printing. With very simple equipment and unskilled labor, silk screen printing may be used to print on sheets, moldings, fabrications, in fact on any object with sufficient flat or cylindrical portions to be effectively marked.

Testing

EVALUATION OF HEAT-SEAL ADHESIVES. H. Wittcoff and S. Peerman. Modern Packaging *26*, 134-40 (Nov. 1952). Procedures for evaluating heat-seal adhesives are described. The preparation of the film, the determination of sealing temperature and sealing range, formation of bonds between various surfaces, and determination of bond stability are described. An apparatus for determining heat-sealing range is described.

CRACK DETECTION WITH FLUORESCENT INK. Brit. Plastics *25*, 344-45 (Oct. 1952). A fluorescent ink is used to detect cracks in plastic moldings.

EVALUATION OF POLYVINYLPYRROLIDONE PREPARATIONS. G. B. Levy, I. Caldas, Jr., and D. Fergus. Analytical Chem. *24*, 1799-1803 (Nov. 1952). The evaluation of new drug products, particularly those intended for intravenous applications, requires circumspect consideration. This was the case with polyvinylpyrrolidone, which is being introduced to the United States as a plasma extender. The nature of the product required the investigation of two chemical tests—the determination of monomeric vinylpyrrolidone and of moisture, the only two compounds usually found admixed with polyvinylpyrrolidone. The physical-chemical evaluation of the polymer presented a more complex problem, which was studied in detail. A compromise was found so that relatively much information can be gained from a few simple operations and tests. The proposed method consists of the removal of inorganic salts, a two-cut fractionation of the polyvinylpyrrolidone solution, and determination of intrinsic viscosity of the solution and the fractions. Presented as a model of procedure.

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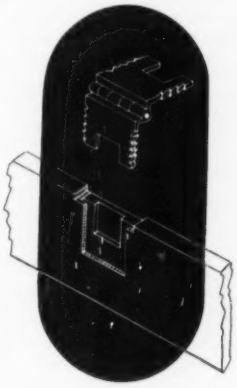

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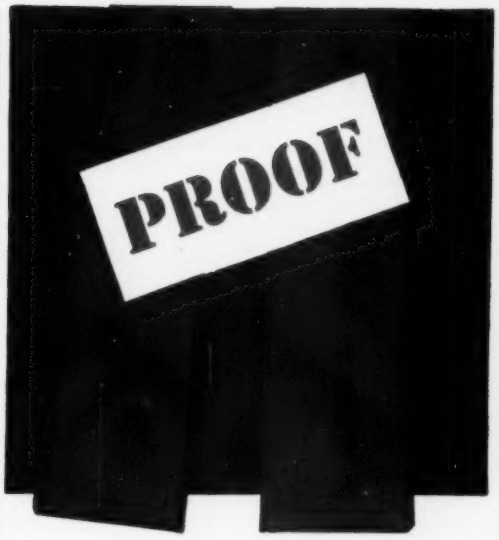

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

RESINS. R. S. Yost and R. W. Auten (to Rohm and Haas). U.S. 2,616,874, Nov. 4. Methylol derivatives of ureido-polyamines.

METHYL METHACRYLATE. M. Mention (to Les Usines de Melle). U.S. 2,616,878, Nov. 4. Process for polymerizing methyl methacrylate.

VINYL ETHERS. A. O. Zoss (to General Aniline). U.S. 2,616,879, Nov. 4. Producing polyvinyl alkyd ethers.

VINYL CHLORIDE. D. C. Seymour (to U.S. Rubber). U.S. 2,616,880-1-2-3-4-5-6-7-8, Nov. 4. Shortstopping vinyl chloride polymerization with conjugated trienic terpenes, unsaturated ketones, vinyl pyridine, conjugated dienes, and other unsaturated monomers.

RESINS. E. C. Ladd (to U.S. Rubber). U.S. 2,616,899, Nov. 4. Chlorinated epoxy compounds.

MOLDING. L. C. Rubin (to M. W. Kellogg). U.S. 2,617,149-50-1-2, Nov. 11. Molding polytrifluorochloroethylene.

THERMOPLASTIC ARTICLES. R. L. Stern (to Hercules). U.S. 2,617,737, Nov. 11. Thermally shaped plastic articles.

CELLULOSE ESTERS. E. J. Wickson, W. J. Myles, and W. B. Horback (to Celanese). U.S. 2,617,738-9, Nov. 11. Cellulose esters, methoxyethyl stearate, paracyclohexyl phenol compositions.

FABRIC TREATMENT. J. K. Dixon (to American Cyanamid). U.S. 2,617,-744, Nov. 11. Treatment of nonwoven fabrics with urea resin colloids.

POLYSTYRENE. J. Bjorksten and L. L. Yaeger (to Nash-Kelvinator). U.S. 2,617,748, Nov. 11. Polystyrene article coated with ultra-violet screening film.

SHEET. W. E. LeClair and E. DeLia (to Interchemical). U.S. 2,617,750, Nov. 11. Decorative vinyl sheet.

BONDING. H. T. von Hauteville (to International Standard Electric). U.S. 2,617,752, Nov. 11. Bonding thermoplastics with R-F heating.

COATING. P. E. Marling (to Monsanto). U.S. 2,617,776, Nov. 11. Alkyd copolymer coating.

VINYL CHLORIDE. E. Heisenberg and J. Kleine (to Vereinigte Glanzstoff-Fabriken). U.S. 2,617,777, Nov. 11. Solutions of polyvinyl chloride in tetrahydrofuran and a sulfur compound.

POLYMERS. E. W. Gluesenkamp (to Monsanto). U.S. 2,617,778, Nov. 11. Vinyl chloride resin plasticized with aromatic thioalcohol esters.

VINYL RESINS. R. K. Griffith and H. C. Nelson, Jr. (to General Electric). U.S. 2,617,779, Nov. 11. Plasticized vinyl halide insulators.

COATING. R. H. Lutz. U.S. 2,617,780, Nov. 11. Acrylic polymer dissolved in aerosol solvent.

COPOLYMERS. M. R. LyHon (to Chemstrand). U.S. 2,617,781, Nov. 11. Copolymers of quaternary salts of butene-1 derivatives.

ACRYLONITRILE. R. J. Slocombe and G. L. Wesp (to Monsanto). U.S. 2,617,783-4, Nov. 11. Stabilized acrylonitrile polymers.

RESIN. E. G. K. Pritchett and G. Barnett (to Carbide and Carbon). U.S. 2,617,785, Nov. 11. Phenolic resin.

RESINS. D. T. Mowry (to Monsanto). U.S. 2,617,786, Nov. 11. Polyamide resins from dinitriles and formaldehyde.

INTERPOLYMERS. P. O. Tawney (to U.S. Rubber). U.S. 2,617,787, Nov. 11. Quaternary interpolymers of unsaturated polyacids, monovinyl benzenes, unsaturated esters, and alkenyl alcohols.

COATING. G. S. Schaffel and A. S. Wollison (to General Tire and Rubber). U.S. 2,617,788, Nov. 11. Flexible coating of a copolymer of acrylonitrile, alpha-methylstyrene, and ethyl acrylate.

COPOLYMERS. F. C. McGrew and P. S. Pinkney (to Du Pont). U.S. 2,617,789, Nov. 11. Acetylene-vinyl carboxylate copolymers.

RESINS. J. M. Butler (to Monsanto). U.S. 2,617,790, Nov. 11. Reaction of polystyrene with an isocyanate.

ION EXCHANGE. W. E. Bergman (to Phillips Petroleum). U.S. 2,617,800, Nov. 11. Purification of carboxymethyl cellulose with ion exchange resins.

POLYAMIDES. A. W. Ralston, R. J. Van der Wal, and J. Harwood (to Armour). U.S. 2,617,813, Nov. 11. Condensates of polyunsaturated carboxylic acids and polyunsaturated amines.

SPLICING. G. B. Keller and L. D. Holmes. U.S. 2,617,914, Nov. 11. Device for splicing strands of thermoplastic material.

CASTING. W. R. J. Happe' (to (Happe' Products). U.S. 2,618,017, Nov. 18. Cast products of urea resin plasticized with albumins.

CELLULOSE DERIVATIVES. J. Downing and J. G. N. Drewitt (to British Celanese). U.S. 2,618,018, Nov. 18. Treating cellulose derivatives to make them more easily powdered.

PANELS. C. D. Orsini (to Nixon Nitration). U.S. 2,618,019, Nov. 18. Variegated thermoplastic panels.

MOLDING COMPOUND. W. F. Busee and J. M. Lambert (to General Aniline). U.S. 2,618,020, Nov. 18. Poly-N-pyrrole molding composition.

LAMINATING. R. W. Kerr and W. C. Koenig. U.S. 2,618,310, Nov. 18. Apparatus for making laminates.

CELLULOSE ACETATE. L. W. A. Meyer and W. M. Gearhart (to Eastman Kodak Co.) U.S. 2,618,568, Nov. 18. Self-extinguishing cellulose acetate moldings.

SHEET. C. R. Oswin (to British Cellophane). U.S. 2,618,575, Nov. 18. Coating vinylidene chloride-acrylonitrile copolymer on another material.

PANEL. F. Lyijynen (to Briggs

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VINYL STABILIZERS

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Harshaw, a pioneer and outstanding producer of metal organic chemicals, for more than 50 years, now offers broadly tested special products of controlled uniformity to assist vinyl resin processors in formulating heat and light stabilized systems efficiently, effectively and economically.

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*Harshaw vinyl stabilizing systems comprise small amounts of two or more stabilizers, selected to give the required control against vinyl degradation.

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Organic complexes for outstanding clarity. Clear pale liquids. Frequently used with barium and organic stabilizers.

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White powdered highly compatible barium compound. Does not bloom or plate-out of calendered stocks. Improves viscosity stability in plastisols. Frequently used with cadmium stabilizers with or without organic assistants.

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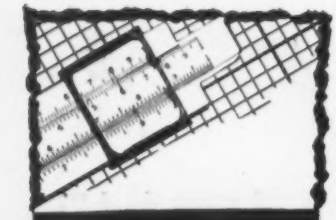

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Manufacturing). U.S. 2,618,581, Nov. 18. Laminated trim panel.

WELL DRILLING. W. E. Gloor (to Hercules). U.S. 2,618,595, Nov. 18. Carboxyethyl-hydroxyethyl cellulose well-drilling mud.

CARBOXYMETHYL CELLULOSE. C. H. Rigby and C. A. MacInnes (to Imperial Chemical). U.S. 2,618,609, Nov. 18. Carboxymethyl cellulose manufacture.

RESIN. R. W. H. Tess and T. F. Mika (to Shell). U.S. 2,618,616, Nov. 18. Modified alkyd resins.

RESINS. L. E. Caldwell and C. Frazier (to American Cyanamid). U.S. 2,618,617, Nov. 18. Preparation of oil-modified alkyd resins.

RESIN. P. L. Rosamilia and S. Caplan (to Harvel). U.S. 2,618,618-9, Nov. 18. Cashew nut shell liquor-Vinsol compositions.

PLASTICIZERS. S. L. Burt (to Carbide and Carbon). U.S. 2,618,621, Nov. 18. Vinyl chloride resin dispersed in polyglycol methacrylates.

PLASTICIZER. O. J. Grummit, R. E. Blank, and H. F. Schwartz (to Sherwin-Williams), U.S. 2,618,622, Nov. 18. Plasticizer for vinyl halides.

SOLVENTS. K. Tessmar (to Rohm and Haas). U.S. 2,618,623, Nov. 18. Solvents or plasticizers for acrylonitrile polymers.

STABILIZERS. G. P. Mack and E. Parker (to Advance Solvents and Chemical). U.S. 2,618,625, Nov. 18. Resins stabilized with organo-tin sulfonamides.

POLYMERIZATION. C. P. van Dijk and F. J. F. van der Plas (to Shell). U.S. 2,618,626, Nov. 18. Polymerization of olefins.

POLYMERS. H. W. Coover, Jr., N. H. Shearer, and J. B. Dickey (to Eastman Kodak). U.S. 2,618,627, Nov. 18. Polymers of 3-methylenephthalide.

POLYMERS. J. J. Hayes (to Mathieson). U.S. 2,618,628, Nov. 18. Polymers of nuclear chlorinated alpha-methylstyrene.

CELLULOSE ETHER. E. D. Klug (to Hercules). U.S. 2,618,632, Nov. 18. Mixed cellulose ethers.

CELLULOSE DERIVATIVES. C. L. P. Vaughan (to Hercules). U.S. 2,618,-633-4-5, Nov. 18. For the production of Carboxyethyl cellulose.

ADHESIVES. E. A. Kalafus (to General Tire and Rubber). U.S. 2,619,-445, Nov. 25. Rubber to metal adhesives.

BINDER. L. A. Kovreg (to Owens-Corning). U.S. 2,619,475, Nov. 25. Glass fiber binder comprising furfuryl alcohol and starch carbonate.

COATING. T. P. Malinowski (to Monsanto). U.S. 2,619,476, Nov. 25. Coating comprising a glyceride drying oil and a mixed ether of methylolmelamine.

COPOLYMERS. F. W. Banes and E. Arundale (to Standard Oil). U.S. 2,619,477, Nov. 25. Copolymers of dimethyl itaconate and conjugated diolefins.

MOLDING COMPOSITIONS. H. W. Wehr, Jr. and W. C. Sager, Jr. (to Dow). U.S. 2,619,478, Nov. 25. Molding compositions of vinyl aromatic resins.

POLYMERS. D. M. McQueen (to Du Pont). U.S. 2,619,479, Nov. 25. Stabilizers for polymers.

RESIN. R. Lindenfelser and M. Kilthau (to American Cyanamid). U.S. 2,619,480, Nov. 25. Acetylbenzamide as latent catalyst for melamine resins.

RESINS. L. E. Beare, M. P. Kleinholz, and W. S. Hoock (to Sinclair Refining) U.S. 2,619,482, Nov. 25. Reaction of a terpene, sulfur, phosphorus sulfide, and an alkylated phenol.

ADHESIVE. P. G. Schrader and A. M. Partansky (to Dow). U.S. 2,620,-288, Dec. 2. Adhesive mixture of nucleated and non-nucleated resins.

SHEET. D. J. Douglas (to Minnesota Mining). U.S. 2,620,289, Dec. 2. Heat activatable, heat-sensitive adhesive.

ION EXCHANGE. L. A. Lundberg (to American Cyanamid). U.S. 2,620,-315, Dec. 2. Polyethylenemelamine-polyamine reaction products.

ACCELERATOR. T. Boyd and R. B. Green (to Monsanto). U.S. 2,620,318, Dec. 2. Condensation of polymer of organic titanium compound.

SHEET. W. Rowe and S. A. Cohen (to Bonafide Mills). U.S. 2,620,319, Dec. 2. Resin-bonded wall or floor covering sheet.

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NEW MACHINERY AND EQUIPMENT

HEAT-SEALING IRON—A hand iron which acts as a heat-sealing unit for sealing film wraps and applying labels, has been produced by Cleveland Lathe & Machine Co., Dept. 80, 5400 Brookpark Rd., Cleveland 29, Ohio. The machine, known as the "Stimpson Super Sealer," features a square toe and a thermostat with a 250 to 550° range, which make it suitable for Pliofilm, polyethylene, acetate, saran, and other materials. A Teflon boot is available, to simplify the sealing of "soft" films like Pliofilm and polyethylene. The company states that the iron has been designed to stand up under constant usage, with a long, sturdy spring to prevent fraying of the cord where it leaves the handle.

HYDRAULIC RELIEF VALVE—Designed for high pressure and high volume circuits, a new 2-in. hydraulic control valve has been announced by The Denison Engineering Co., Columbus, Ohio. The valve provides pressure control up to 5000 p.s.i., with volume capacities up to 125 g.p.m.; it offers low differential between opening and closing pressures, and a close fit of all sealing surfaces within the valve body, reducing leakage to almost zero. Pressure setting is adjusted by a knurled screw on the valve cap. Provision is also made for remote control of this regulation.

The valve is furnished either with threaded body or for subplate mounting. When using the subplate type mounting, the relief valve is necessarily, because of its design, T'd off the pressure line. The piping is connected to the subplate and the valve is mounted on the plate. This type of installation provides a means of removing the valve at any time without having to break the pipe connections.

MAGNETIC BRAKE—A hysteresis brake that holds constant tension on yarn or wire by magnetic drag instead of friction has been announced by the Control Dept., General Electric Co., Schenectady 5, N. Y. The brake consists of Alnico magnets so designed and mounted that a magnetic drag (or hysteresis effect) offers a restraining force on a pulley. This force is essentially constant at all speeds and can be adjusted simply by turning the calibrated head mounted above the pulley.

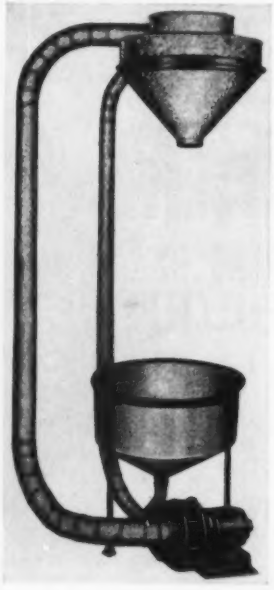
The restraining force of the magnets assures minimum abrasion on the yarn, since the material is always in contact with the revolving pulley and is not rubbed or drawn over the surface.

The brake is said to reverse the direction of rotation a few degrees after stopping, thereby holding stalled tension. The inertia of the brake itself is slight enough that the yarn does not become unthreaded during quick acceleration and deceleration.

The construction of the brake permits operational speeds up to 700 yd. per min., while tension control ranges from 3.5 to 10.5 grams. Applications for the device include tension control for glass-fiber, small-diameter wire, rubber, and yarns.

AIR ELEVATOR—A new adaptation of its air elevator, designed for the plastics industry, has been announced by B. F. Gump Co., 1313 So. Cicero Ave., Chicago 50, Ill. The unit was designed as a simple, practical means of lifting granulated plastics from the floor or other location to the hopper above the molding machine, particularly where head space is limited. In installations where the molding machine is fed by weighed-starved feeding, the elevator can be used to supply the hopper of the weigher. Advantages claimed include low initial cost, easy installation, simplicity of operation, and easy cleaning. No particles are left in the receiving hopper to mix with the next batch of material. Any dust that may remain in the pipes is easily cleaned out when changing from one color to another.

The air elevator includes a receiving hopper, fan (directly connected to the motor), air filter at intake to prevent contamination of the plastics, Venturi adjustment to regulate capacity, and necessary pipes. An upper expansion chamber is provided, where the air is released and the plastic material is permitted to drop into the molding machine or weigher hopper. Air release is arranged for ring-around return to the fan, reducing to a minimum the quantity of air taken from the room.



The receiving hopper is designed to prevent flooding of the Venturi

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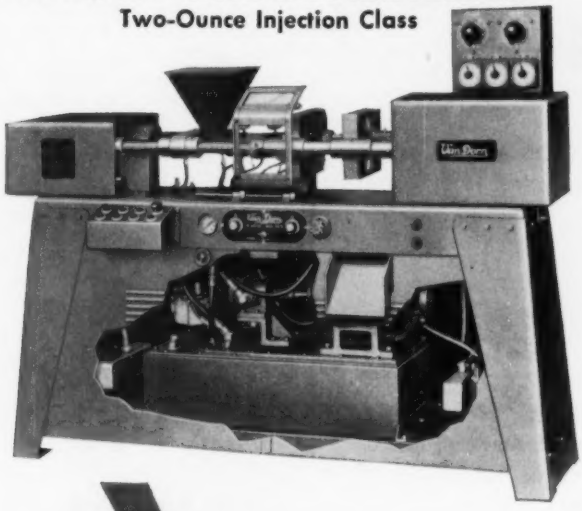
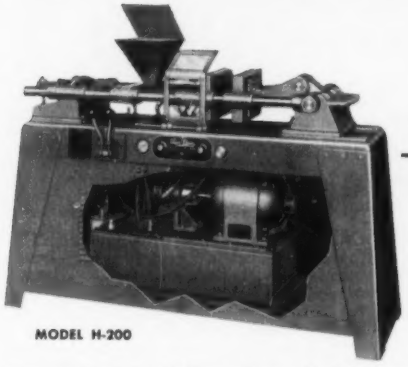
Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



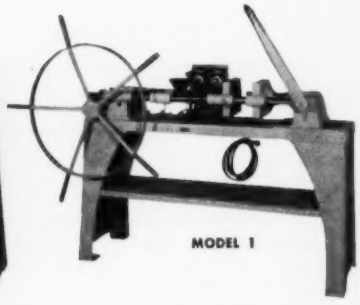
This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200

Power Operated, Lever Controlled Presses

2-oz. or 1-oz. capacity. These low-cost units operate 8 hours for under a dollar and use inexpensive molds. Can easily be set up in twenty minutes by one man.



MODEL 1

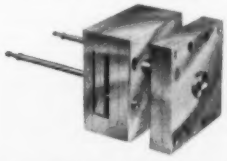
Manually Operated Press

1-oz. capacity. This press is ideal for smaller jobs, experimental work and technical training.

MODEL G-100

Plastic Grinder

Grinds up rejects, waste, etc., for re-use. Ruggedly made, designed for easy cleaning.



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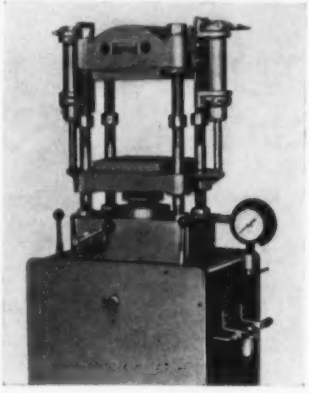
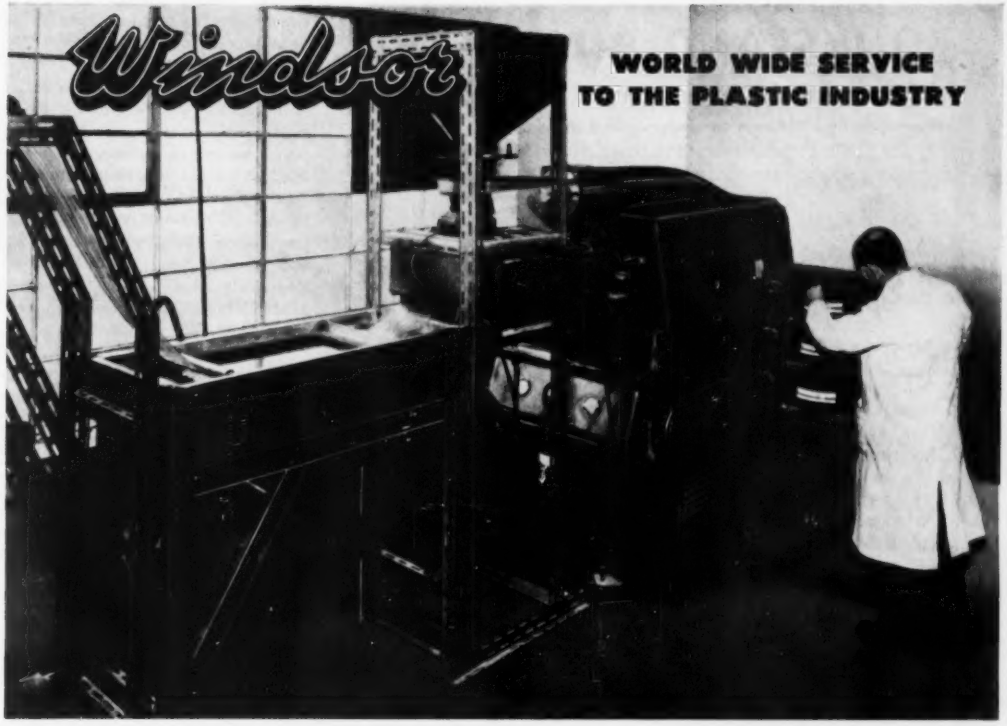
when the fan is shut off. This feature makes it practical to automatically maintain the desired level in the molding machine hopper, by means of bin level indicators. The hopper is self-supporting. Permanent magnets can be installed in the receiving hopper to remove any particles of steel and tramp iron from the plastics material. Installation of such magnets is recommended by the manufacturer as insurance against the possibility of seriously damaging an expensive mold. The standard size air elevator has a capacity of 1000 lb. per hour. Larger sizes are available. Standard units are recommended for vertical lifts up to 20 ft. and horizontal runs up to 10 feet.

MOLDING PRESS—A modification of the standard design 30-ton plastic molding press manufactured by American Steel Foundries, Elmes Engineering Div., 1150 Tennessee Ave., Cincinnati 29, Ohio, is now



available with air-operated push-back cylinders for powdered ram return. This "Hydrolair" press was made for continuous production of molded cord and plug sets of the type widely used for connecting electrical appliances.

Selected pressure is automatically applied and maintained, even on compressible materials. In addition to the 30-ton model illustrated, the machines are available in the standard 50-ton floor model with either lever or electrical control, and in 30-ton bench and floor models with lever control only.



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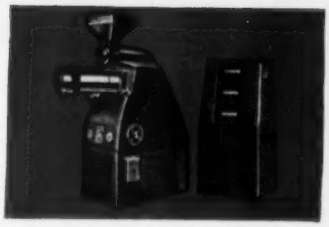
Messrs. "Lustrac" Plastics, Ltd., of Welwyn Garden City, England, installed a "WINDSOR" R.C.200 triple screw extruder-compounder to produce polystyrene granules.

The equipment shown in the above illustration is pelletising styrene at an average hourly output of 140-190 pounds per hour, running for eleven hours per day, 5½ days per week, giving excellent colour dispersion and uniform pellets ready for moulding.



R.C. 65

R.C. 100

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Economics of Natural Gas in Texas," by John R. Stockton, Richard C. Henshaw, Jr., and Richard W. Graves.

Published in 1952 by Bureau of Business Research, College of Business Administration, The University of Texas, Austin, Texas. 316 pages. Price $5.00.

This comprehensive discussion of natural gas economics, making use of 60 illustrations and 90 separate tabulations, presents a factual treatment of the problems facing the natural gas industry. Although this study emphasizes the position of Texas natural gas in the over-all national picture, it also offers such diverse information as the supply-and-demand relationships which exist between natural gas and other fuels, such as oil, coal, water power, and atomic energy.

The book contains eleven chapters in which the following subjects are discussed: history and nature of natural gas; utilization of natural gas and natural gas liquids; chemical manufacture of synthetics from natural gas; production; reserves; transportation; taxation; public control; conservation; and competition with other fuels. A bibliography is included at the end of each chapter.

"Deutsches Jahrbuch fur die Industrie der Plastischen Massen 1945/1950," edited by K. Fabel.

Published by Wilhelm Pansegrau Verlag, Berlin-Wilmersdorf, Wilhelmsaue 22. 6th edition. 470 pages. Price DM32.60.

This yearbook for the plastics industry fills the gap between the 1942 edition and 1950. It gives an account of the advances in plastics research and production since the end of the war in 1945, with special emphasis on developments in countries outside of Germany, especially the United States. This is accomplished by a group of articles on special phases of the plastics industry. Three short articles deal with plastics based on cellulosics, proteins, and natural resins, respectively. The larger part of the book is devoted to articles concerning the development of synthetic resins and plastics, written by experts in the field. They contain an abundance of information, including literature and patent references. Other chapters cover nomenclature, processing methods, and machinery. The last two chapters contain directories of domestic and foreign trade names and sources of supply.

"Davison's Textile Blue Book."

Published in 1952 by Davison Publishing Co., Ridgewood, N.J. Office edition, 1500 pages, $9.25. Handy edition, printed on thin paper with cloth cover, 1400 pages, $6.50. Foreign, 50 cents extra.

Containing complete and late reports on textile mills, dyers, and allied firms, including new personnel, new addresses, new markets, and new places to buy, this 87th edition covers the United States and Canada. Providing details of over 9000 textile plants, the volume also contains reports on rayon, nylon, and other synthetic fibers and yarns. A special buyers' guide section lists many thousands of firms selling raw materials, yarns, supplies, machinery, and services to mills.

Testing machines—Detailed information on instrumentation, tools, and accessories is given in this 24-page catalog. Also listed are electronic recorders, testing tools, and control accessories. *Tinius Olsen Testing Machine Co., 1068 Easton Road, Willow Grove, Pa.*

Glass fabrics—Descriptive and physical data on glass filaments are given in this 4-page catalog sheet. *Madagascar Graphite & Mica Co., 92 Liberty St., New York 6, N. Y.*

Synthetic methanol—Uses of methanol, specifications under which it is sold, methods of test, and a short discussion of toxicology and safety measures are covered in this 32-page booklet. An extensive collection of data on physical properties is presented. Among the 22 tables that supplement the text are those listing density, viscosity, specific heat, and surface tension of methanol at various temperatures; binary azeotropes of methanol; thermodynamic properties; dielectric constant at various temperatures; and boiling points, refractive indices, viscosities, and surface tensions of methanol-water solutions. Directions and suggested precautions for shipping, handling, and storage are given. *Industrial Chemicals Dept., Commercial Solvents Corp., 260 Madison Ave., New York 16, N. Y.*

Process equipment—Dry blending, process, and heat exchange equipment is covered in this 12-page catalog. Directed particularly to engineers in the processing industries, the text places special emphasis on a twin-shell dry blender. Photographs, drawings, and tables show how the unit operates in blending powders, grains, pellets, and flakes in any combination. In addition, the catalog covers characteristics, applications, capacities, power requirements, and other specification data for twin-shell, double-cone, and ribbon blenders; kettles; evaporators; stills; agitators; autoclaves; pilot-plant units; and heat exchangers. *Patterson-Kelley Co., Inc., 418 Warren St., East Stroudsburg, Pa.*

Scientific management — Entitled "Progress In Scientific Management", this 32-page booklet lists AMA publications in eight fields of management. Among the fields represented are personnel, manufacturing-production, office management, marketing, and financial management. *American Management Association, 330 W. 42 St., New York 36, N.Y.*

Temperature-humidity tests—Temperature-humidity test chambers which can provide temperatures from −100° to +200° F. and relative humidities from 20 to 95% are described in this 4-page two-color bulletin. Specifications give data on heaters, humidification, de-humidification, temperature and humidity controllers, compressor equipment, insulation, exterior construction, access doors, air circulation, standard equipment, and optional equipment. Chamber construction information, performance characteristics, and

DESIGN and PRODUCTION NEWS

FOR PLASTICS AND MATERIALS ENGINEERS

Published by TECHNICAL SERVICE, Chemical Manufacturing Division, The M. W. KELLOGG Company MARCH 1953

Corrosives Handling Licked with new Drum Liners

Chemically inert drum liners made of Kel-F polymer film that will last indefinitely, are now making it possible to store or ship corrosive materials in ordinary steel or fibre drums, without contamination. Applications are virtually unlimited since the fluorocarbon material effectively resists dilute and concentrated mineral acids (including fuming nitric, aqua regia), alkalis, corrosive solids and pastes. (And, liners can be made in any size and shape.)

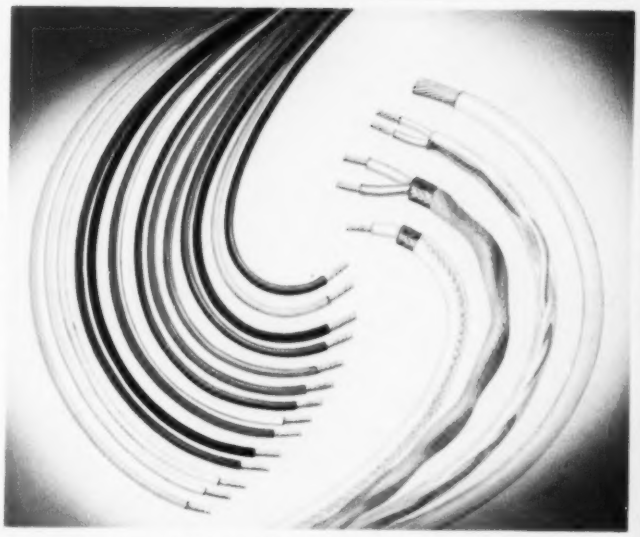
Electronic Wave Products, Inc. of New York, N.Y. uses .005 film extruded from Kel-F and an exclusive electronic seam-sealing process to produce the liners—at the present for 5, 15, and 55 gallon drums. Kellogg's fluoro-chloro-carbon plastic, Kel-F, was chosen for this purpose because of its chemical inertness at high and low temperatures . . . toughness and ability to withstand hydraulic shock . . . it will not stick to the container, nor will the contents stick to it . . . continuous reuse and aging will not embrittle it . . . banding and tying will not damage it . . . electronically sealed seams will not give way.

Initial cost of the liners is higher than that of glass vessels, but their

obvious advantage of lightness and unbreakability results in a cost advantage in shipping. They permit use of uniform drums for efficient stacking. Compared with alloy steel drums ordinarily used in handling fuming nitric acid, a liner made of Kel-F costs but a fraction, and its long life, without contaminating the product, gives it a decided advantage.

Available only in liners of the "peel over" and "tie off" types at the present time, other types, with flexible and rigid spouts are planned.

Refer to Report C 101



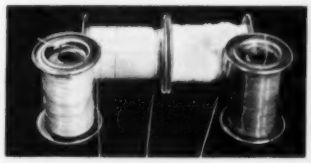
New Hook-up Wire with Extruded KEL-F* Insulation Solves Heat and Damage Problems

This new wire, coated with KEL-F*, is ideally suited for the totally-enclosed or hot wiring job where it solves the dual problem of heat and damage that has faced designers for years. *First*, even in the most cramped assembly jobs, a careless slip of a tool or soldering iron won't damage Kel-F — you can't split it with a hammer under normal conditions; it melts at about 410° F. *Second*, the insulation retains its *full* physical and dielectric properties at temperatures to 300° F. No leakage . . . no shorts.

Surprenant Mfg. Co. of Boston, Mass. was one of the first extruders to recognize these Kel-F qualities, and the company developed its own techniques for extruding an evenly balanced coating of the plastic on wire of all types. Early stranded single conductors have been followed by twisted paired wires individually insulated with Kel-F and encased with a jacket of Kel-F . . . then individually insulated wire — or a twisted pair — surrounded by braided metallic shielding and covered with a plastic jacket. Surprenant has also developed a wide range of color-coded wire—13 colors in all.

All Surprenant wire coated with Kel-F polymers is marketed under the company's trade name "Surflene".

While resistance to heat and damage, and excellent insulating qualities are most important in the usual application, wiring installations for service in sub-zero or humid, tropic locations, or exposure to corrosive chemicals or vapors can utilize the unusual chemical inertness and 4 to 500 degree effective utility range of Kel-F to insure trouble-free performance.



Refer to Report E 101

(SEE REVERSE SIDE)

* *Registered trademark for The M. W. Kellogg Company's trifluorochloroethylene polymers*

KEL-F

FLUORO CHLORO CARBON PLASTIC

KEL-F

FLUORO CHLORO CARBON PLASTIC

KEL-F

FLUORO CHLORO CARBON PLASTIC

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KEL-F

FLUORO CHLORO CARBON PLASTIC

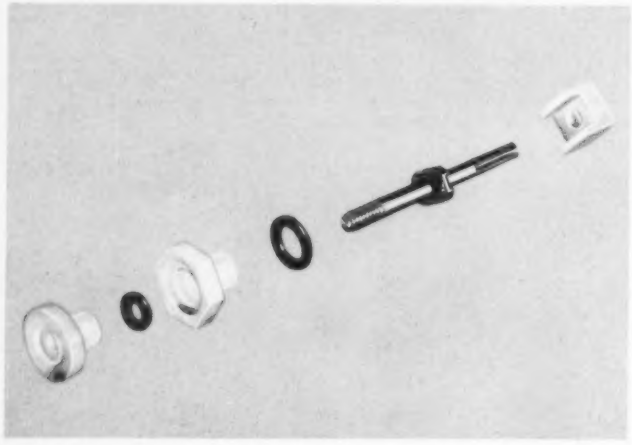
KEL-F

FLUORO CHLORO CARBON PLASTIC

CONTINUED FROM PRECEDING PAGE

Aircraft Instrument Requires Corrosion Resistance, Stability under Harmonic Vibration

. . . and less than 10,000 Megohm Leakage!



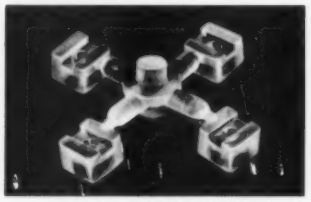
Only KEL-F *Qualified! Rigid Air Force requirements for the fuel indicator part shown here could only be met by Kel-F polymers because of their unique combination of properties. Tough operating conditions eliminated all other materials.

Specs for the instrument prohibited "cold flow". The part was to be in constant contact with corrosive fuels, hydraulic-type and other test fluids at low and high temperatures. Stability under severe harmonic vibration and no permissible moisture absorption were additional limitations.

The high dielectric strength of Kel-F over a wide temperature range satisfied the minimum leakage requirement. Its unique chemical composition, responsible for both its superior chemical inertness and its low "cold flow", assured dependable operation of the indicator in spite of temperature fluctuations or contact with corrosive liquids. The proven zero moisture absorption of the fluoro-chloro-carbon plastic precluded any trouble from water absorption or fungus accumulations. The toughness, lack of brittleness, over a wide temperature range permitted the parts made of Kel-F to remain unaffected after exposure to sustained harmonic vibrations.

New KEL-F Plant Slated for Early Operation . . . .

The new 1,000,000 pound plant for the production of Kel-F polymers is scheduled to go into full-scale operation within the next month. It is believed that the radically-increased production from these new facilities will completely relieve the tight supply situation which has existed because of the widespread use of Kel-F for defense projects...enabling industry to proceed into commercial production with the many projected applications of this unique fluoro-chloro-carbon material.



Typical component parts as injection molded

Brilhart Plastics Corporation of Mineola, N.Y., acquainted with the ready moldability of Kel-F, injection molded the indicated parts to the exact tolerances required in the specifications. Design of their molds and the excellent thermoplastic characteristics of Kel-F polymers resulted in molded parts which required no finishing or machining prior to use.

Refer to Report C 102

Molders of the Month

Leading molders and extruders specialize in fabrication of materials and parts made of Kel-F . . . each month this column will spotlight several of these companies with their principal services and products.

Chicago Die Mold Division
U. S. RUBBER COMPANY
Chicago, Ill.
Compression and Injection Molding
Valve Diaphragms
Military Components

Plax Corporation
Hartford, Conn.
Extruded Rod and Tubing
Molded Rod and Tubing
Molded Sheets (to 1/8" thick)
Injection Molding
Military Components

Resistoflex Corporation
Belleville, N. J.
Extruded Rod and Tubing
Compression Molded Sheets and Discs

Revere Corp. of America
Wallingford, Conn.
Coated Wire and Cable

United States Gasket Company
Camden, N. J.
Compression Molding
Gaskets and Packing
Extruded Rod and Tubing
Injection Molding
Military Components

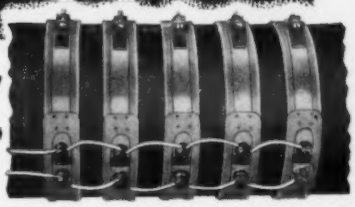
The Visking Corporation
Terre Haute, Ind.
Extruded Thin Film
Extruded Lay-flat Tubing

For complete information regarding any item mentioned in DESIGN AND PRODUCTION NEWS, ask for detailed APPLICATION REPORTS, write

Technical Service
CHEMICAL MANFACTURING DIVISION
THE M. W. KELLOGG COMPANY
P. O. Box 449, Jersey City 3, N. J.
or offices in New York, Chicago, Los Angeles
KELLOGG PULLMAN

* *Registered trademark for The M. W. Kellogg Company's trifluorochloroethylene polymers*

better PLASTIC PRODUCTS
Begin with
better HEATING UNITS



WATLOW NARROW BANDED HEATING UNITS

EFFICIENT HEAT TRANSFER . . . High heat concentration of 35 to 45 watts/sq. in. Compact, thin, light-weight construction permits closer temperature regulation; eliminates costly temperature lag. Each unit is 1½" wide.

FEWER BURNOUTS . . . High dielectric strength means less cross-section of insulation—resulting in shorter path of heat, lower internal operating temperature, longer life.

QUICK, LOW-COST REPLACEMENTS . . . Easily replaced one unit at a time . . . with only fractional heat loss.

BETTER FITTING UNITS . . . Relatively low expanding metal band keeps unit firmly clamped to surface at all temperatures for steady, constant heat.

SEND for Watlow Catalog—gives valuable heating information on Strip, Band, Cartridge, Immersion Heaters.

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COATING
AND
LAMINATING

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typical applications are also included. Interior dimensions and temperature ranges for eight different standard model types are tabularized in a specification section. Bulletin TR. *Tenney Engineering, Inc., 26 Ave. B, Newark 5, N.J.*

Marking tools—Over one hundred different marking tools and devices are described and illustrated in this 28-page catalog. The basic groupings of products are stamps—made-to-order hand stamps, inspection and symbol stamps, letter and figure stamps, mold stamps, and press stamps; marking machines and fixtures; special marking outfits; press and hand type holders; dies and die inserts; engineers' and inspection hammers; and steel type. Catalog numbers, photographs, and size charts complete the text. *M. E. Cunningham Co., 1495 North Ave., Pittsburgh 33, Pa.*

Electrical Embedment resin—The embedding of electrical components in insulating resins is described in this 8-page illustrated booklet. Applications are given for both hot pouring and cold pouring resins. The use of fillers to obtain special characteristics is discussed, and casting techniques are outlined briefly. Properties of the company's epoxy type "Scotchcast" resins are presented in detail. *Minnesota Mining and Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.*

Tap Catalog—Covered in this new 16-page catalog are hand, machine screw, nut, pulley, pipe, tapper, and hook taps. Each type is illustrated to facilitate identification. Charts following each illustration provide complete ordering information. Drill sizes are given for various thread specifications. Bulletin No. 51-813. *The DoAll Co., Des Plaines, Ill.*

Sales quota guide—Entitled "A Guide To Sales Quota Setting," this 64-page, paper-bound, lithoprint booklet by John E. Ullmann presents an examination of the sales quota system. The author discusses the purposes such systems can serve, the types which are used, and how they are applied in industry. Specifically, the text examines quotas in the light of market and product characteristics, lists the types in common practice, and describes specific purposes, such as profit control, selective selling, and sales mixture control. The employment of sales quotas in both the chemical process industries and the capital goods industries is examined in detail. Each of these industries is reviewed as to its special characteristics and the manner in which sales quotas fit into its operations. The function of sales forecasting as affecting quota selection and use is also discussed. Available for $3 from *Chemonomics, Inc., 400 Madison Ave., New York 17, N. Y.*

Synthetic organic chemicals—Data on more than 320 products are contained in the 1953 edition of the 20-page booklet entitled "Physical Properties of Synthetic Organic Chemicals." This edition includes a section on 56 new research chemicals, among them being synthetic alpha-picoline; diethoxy terahydrofuran, a source of succindialdehyde; and four new vinyl monomers. The chemicals are arranged by family groups. Condensed data on applications are presented and physical properties are given in tabular form.

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Witco manufactures stabilizers for polyvinyl chloride plastics to meet your individual stabilizing requirements. The services of Witco's Technical Service Department are available to resin processors with specific problems involving the use of these stabilizers.

WITCO Stabilizer #90 . . . non-toxic. Acceptable U.S.D.A. and F.D.A. for food-wrapping film.

WITCO Stabilizer #80 . . . high efficiency, liquid, efficient under dynamic heat conditions. Valuable in plastisols and organosols.

WITCO Stabilizer #70 . . . unusual heat stability, unimpaired clarity, good lubricity.

WITCO Stabilizer #40 . . . light and heat stabilizer for transparent film, sheeting, extruded compounds.

WITCO Lead Stearate #30 . . . for opaque and semi-transparent compounds. Especially good for electrical insulating materials.

WITCO Lead Stearate #50 (dibasic) high lead content, heat stabilizer and lubricant for opaque goods.

WITCO Cadmium Stearate . . . light stabilizer for transparent formulations.

WITCO Barium Stearate...for high clarity, color-stable items which come in contact with sulphur fumes.

WITCO Calcium Stearate . . . non-toxic. Acceptable U. S. D. A. for vinyl films for foodstuffs.

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Booklet F-6136. *Carbide and Carbon Chemical Co., Div. of Union Carbide and Carbon Corp., 30 E. 42 St., New York 17, N. Y.*

Hydraulic presses—An informative picture of 150 years of manufacturing hydraulic and allied equipment is presented in this 32-page color booklet recently re-issued. Facilities, methods, and equipment are discussed. *R. D. Wood Co., Philadelphia 5, Pa.*

Laminate-topped furniture—The 1953 "Buyers Guide to Formica Topped Furniture" includes 93 photos of furniture and dinettes, together with the manufacturer's name, suggested retail price, and the pattern and color of the Formica lamination used. *The Formica Co., Cincinnati, Ohio.*

Vacuum—Entitled "Vacuum—the Magic Hat of Industry," this 12-page reprinted article describes in non-technical language the many industrial methods making use of vacuums. The article also discusses ways of making a vacuum. Included are two full-page charts showing vacuum uses and manufacture. Form 164. *Ingersoll-Rand, 11 Broadway, New York 4, N. Y.*

Formic acid—Summarizing recent research on the uses of formic acid, this technical bulletin describes properties, methods of handling, and preferred equipment and utilizations of the chemical in the textile, pharmaceutical, chemical, plasticizer, and other industries. The use of formic acid in continuous dyeing of nylon fabrics is reported in the textile section of the bulletin. Reviewed also are some of the chemical reactions of the acid such as formylations used in the production of vitamins. *Heyden Chemical Corp., 342 Madison Ave., New York, N. Y.*

Inspection equipment—Designed to meet the needs of inspection departments in plants, laboratories, or elsewhere in industry, this 8-page bulletin illustrates and describes the newest developments in scientific inspection aids. Included are stereomicroscopes, illuminating magnifiers, micro-lights, a complete variety of magnifiers, pocket microscopes, comparators, and miniature lamps. More than 80 different items are listed. *Arthur S. La Pine & Co., 6001 So. Knox Ave., Chicago 29, Ill.*

Fatty acids—Technology and usage of fatty acids from an all-industry point of view are covered in this new 20-page booklet, which describes fat-splitting processes, separation of individual acids such as stearic and oleic, and methods used in purification and chemical modification of the natural acids. A composite flow sheet shows how various animal fats and vegetable oils are processed to yield dozens of different specification products. A review of major uses for fatty acids of different composition is supplemented with a usage chart showing more than sixty specific applications for these materials. Common terms and tests used in specifying fatty acids, such as titer, iodine value, acid value, and the like are explained. Another section deals with handling of fatty acids and the suitable materials of construction. *Fatty Acid Div., Association of American Soap & Glycerine Producers, Inc., 295 Madison Ave., New York 17, N. Y.*

The Plastics Industry—Fifth in a series devoted to American Industries, this 40-page illustrated booklet by Barrett L. Crandall contains a short history of the origin of the plastics industry and an analysis of its processes and materials. Following a chapter on the development of plastics is a discussion on the part played in the make-up of the industry by material manufacturers, molders, fabricators, and laminators. Other chapters deal with forming and fabricating of plastics, sales, plastics materials, personnel, wages, schools, trade associations, and trade papers. A bibliography is also included. *Bellman Publishing Co., P.O. Box 172, Cambridge 38, Mass.*

Industrial fabrics—Over a century of experience in developing and specifying industrial fabrics is reported in a new, 24-page illustrated booklet entitled "Modern Textiles for Industry." Information on industrial fabric applications and developments is given. *Wellington Sears Co., 65 Worth St., New York 13, N. Y.*

Dibutyl adipate—This technical service report describes the uses and properties of dibutyl adipate, its plasticizing applications, and its abil-

ity to impart low-temperature flexibility and water resistance. *Witco Chemical Co., 295 Madison Ave., New York 17, N. Y.*

Laboratory safety—The new edition of the "Manual of Laboratory Safety" is a 48-page illustrated book which contains chapters on accident prevention, first aid, fire prevention, and safety equipment. A safety bibliography covers a wide range of fields including the analytical chemistry of industrial poisons, hazards, and solvents. Included is a reproduction of the revised Laboratory Emergency Chart, which lists rapid treatments for various laboratory mishaps, both external and internal. *Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.*

Plastics in the tropics—The results of exposing expanded plastics to various combinations of tropical conditions for a period of six months are discussed in a 17-page booklet. Reviewed in MODERN PLASTICS, November 1952, at which time an incorrect reference address was used. Correct address for price information is *Sales Dept., British Information Services, 30 Rockefeller Pl., New York 20, N. Y.*

Capsule vials—Plastic capsule vials for pharmaceutical, hospital, and medical use are presented in this 4-page color illustrated folder. Complete information is given as to properties, sizes, capacities, prices, shipping weight, and quantity discounts. *Celluplastic Corp., 50 Ave. L, Newark 5, N. J.*

Electric heaters—A variety of electric comfort heaters is described in this 8-page catalog. Listed are 75 different models of forced air, convection, and radiant heaters in capacities of ¼ to 100 kilowatts. A selector chart serves as a guide in determining both the heating requirements for any area under consideration and the heating unit best suited for the job. Catalog D-52. *Edwin L. Wiegand Co., 7503 Thomas Blvd., Pittsburgh 8, Pa.*

Maintenance costs—A thorough discussion of the profits lost through poor and inefficient maintenance practices is found in this new 10-page pamphlet. The text is concerned also with what measures can be

taken by companies in the chemical process industries to improve results in this department. *R. S. Aries & Assoc., 400 Madison Ave., New York 17, N. Y.*

Methylamines—General information on methylamines, including specifications, properties, uses, and chemical reactions, as well as data on toxicity and storage and handling are given in this 4-page technical report. *Commercial Solvents Corp., 260 Madison Ave., New York 16, N. Y.*

Clear rigid plastic sheets—Optically clear rigid sheets of allyl and styrene materials are the subject of this 8-page illustrated bulletin, which also deals with UHF insulation sheet and rod. Descriptions, tables of properties, fabrication instructions, and some of the uses of the product are included. *Cast Optics Corp., 1 Post Rd., Riverside, Conn.*

Stearates—Discussed in detail in this 32-page technical service bulletin are aluminum, cadmium, calcium lead, lithium, magnesium, sodium, and zinc stearate, as well as special soaps. The various industries in which these compounds find applications and the characteristics of the compounds which fit them for each application are covered both generally and specifically. *Witco Chemical Co., 295 Madison Ave., New York 17, N. Y.*

Precision parts—The small precision metal parts described and illustrated in this 4-page catalog include special pins and pivots; screw driver blades; swaged rods, wires and tubing; mandrels; perforating punches in straight carbon or alloy steels; and tapered or pointed wires and rods. *The Torrington Co., Specialties Div., 500 Field St., Torrington, Conn.*

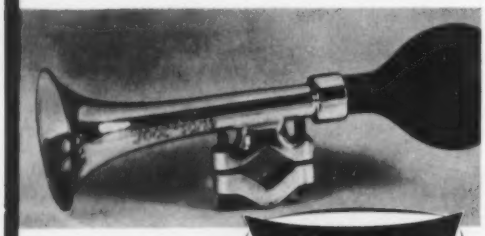
Head loss—Data on head loss due to friction in plastic pipe are available in the form of charts and graphs. *Carlon Products Corp., 10225 Meech Ave., Cleveland 5, Ohio.*

Polyelectrolyte resin—Revised technical information on Lustrex X-820, a carboxyl-containing polyelectrolyte resin, is being offered in the form of a bulletin and a data sheet. Also available are samples of the material. The product is being used as a film-forming vehicle, thickener, binder, emulsifier, protective colloid, dispersing agent, anti-blocking agent, and as a modifier for natural water soluble materials. *Plastics Div., Monsanto Chemical Co., Springfield, Mass.*

Constant temperature baths—Eight-page illustrated booklet offers information to the analyst, bacteriologist, oil chemist, or control technician on combining a variety of jars, heaters, stirrers, thermostats, and other components to produce the precise bath capacity and control required in the laboratory. The booklet lists all the standard parts of the "Unitized" baths. *Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.*

Gages and controls—Continuous gages and control units are described in this illustrated 28-page booklet. These gages are used to measure a wide variety of materials such as plastic, steel, copper, brass, flat wire, paper, and textile. Variations in thickness to 0.0001 in. are indicated. The various control units are used in conjunction with the continuous

This, believe it or not, is a plastic horn!



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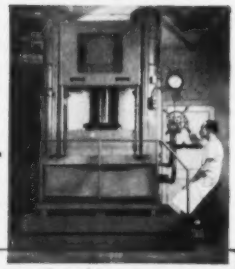
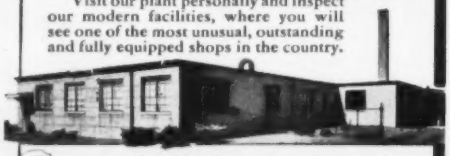


Visit our plant personally and inspect our modern facilities, where you will see one of the most unusual, outstanding and fully equipped shops in the country.



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gages to effect automatic corrections in thickness of materials being rolled or calendered, and to control the diameter of covered wire on extruding machines. *Pratt & Whitney, West Hartford 1, Conn.*

Vacuum research—"Vacuum" is a quarterly review of developments in vacuum research, engineering, techniques, and equipment. Annual subscription is $7.00. Current single copies are $1.75 and back issues $2.10. Published by *W. Edwards & Co., (London) Ltd., Worsley Bridge Rd., Lower Sydenham, London, S.E. 26, England.*

Injection molding of styrene—Injection molding techniques applicable to the molding of styrene are discussed in this 29-page booklet. Designed primarily to help guide the molder to optimum levels of production, the booklet gives special attention to basic considerations of molding equipment, mold construction, and material selection. A section of molding problems lists the recognized causes of eight major molding difficulties. Also included is a 37-question check list, which enables the individual molder to evaluate his own production efficiency. *Production Information Bulletin No. 81. Plastics Div., Monsanto Chemical Co., Springfield, Mass.*

Polyvinyl methyl ether—Properties and uses of polyvinyl methyl ether are listed in this new 12-page bulletin. Among the applications suggested are adhesives, surface coatings, paper, textiles, and heat-sensitized latices. *Commercial Development Dept., General Aniline & Film Corp., 435 Hudson St., New York, N. Y.*

Metallic Soaps Correction

An error occurred in captioning Figs. 4 and 5 of the article "Metallic Soaps as Gelling Agents for Plastigels," published in our February issue. The captions were transposed. The caption ending "made with aluminum soaps" on page 130 of that article should go with the graph appearing at the top of page 132. The caption on page 132 ending "made with various gelling agents" should go with the graph at the bottom of page 130.

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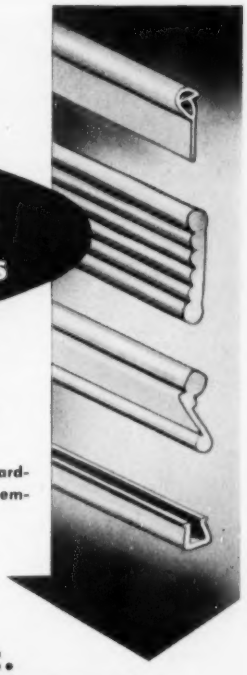

Pyramid excels in the production of special shapes in Vinylite and Geon.

Shown here are a few of the many shapes we have recently produced.

Our Custom service includes plastic coating on "hard-to-coat" materials and fabrication of complete assemblies from SARAN plastic pipe, tubing or rods.

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- Di-iso-octyl Adipate—(DIOA)
- Iso-octyl Palmitate—(0-16)
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Pictured are 3 Sinko Nylon cabinet rollers and a drawer skid-block that are being used successfully by several leading manufacturers of fine kitchen equipment. Sinko Nylon was selected after a series of exhaustive tests had proven its superiority in every respect. In one experiment a small drawer equipped with Sinko Nylon rollers was loaded and automatically operated the equivalent of a normal 200 years service. Upon examination the Sinko Nylon rollers showed little sign of wear.

You too should investigate the many advantages Sinko Nylon offers, among them—resistance to wear and to shock loads, to moisture, chemicals and to temperature; and its smooth-gliding, self-lubricating properties.

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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTIC AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

Materials	*Total p'd'n. first 10 mos. 1952*	*Total sales first 10 mos. 1952*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	8,800,245	9,144,693
0.003 gage and over	7,951,538	7,844,464
All other sheets, rods, and tubes	4,438,443	4,223,754
Molding, extrusion materials	47,870,602	47,334,111
Nitrocellulose:		
Sheets	4,263,607	3,658,840
Rods and tubes	695,701	841,507
Other cellulose plastics[b]	5,667,628	5,451,757
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	54,368,628	35,783,184
Adhesive	31,024,549	32,787,147
Molding and casting materials[a]	136,439,062	123,221,045
Protective coatings (modified and unmodified except by rosin)	21,679,008	18,970,374
Miscellaneous uses	52,331,484	48,093,001
UREA AND MELAMINE RESINS:		
Adhesives	64,246,787	64,082,878
Textile-treating resins	27,232,840	26,175,068
Paper-treating resins	18,790,766	18,533,014
Protective coatings, modified and unmodified	18,994,255	15,264,945
Miscellaneous uses, including laminating and molding[c]	45,247,437	39,704,200
STYRENE RESINS:		
Molding materials[a]	211,617,169	194,529,262
Protective coatings, modified and unmodified	56,618,801	55,791,849
Miscellaneous uses	57,255,621	51,232,685
VINYL RESINS:[d] Total	349,505,478	331,787,245
Sheeting and film (resin content)[e]		130,361,664
Adhesives (resin content)		14,044,042
Textile and paper-treating resins (resin content)[f]		34,748,822
Molding and extrusion materials (resin content)		112,153,301
Protective coatings (resin content)		17,171,591
Miscellaneous uses (resin content)		25,307,825
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	144,084,905	144,640,668
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a, g]	84,626,732	80,544,956
Protective coatings[h]	37,398,316	38,235,627
All other uses[i]	84,952,720	82,129,151

[a] Dry basis is designated unless otherwise specified. [b] Includes fillers, plasticizers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total produc-

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

IN POUNDS[a] FOR SEPTEMBER AND OCTOBER 1952 by U. S. Tariff Commission

September 1952		*October 1952*	
Production	*Sales*	*Production*	*Sales*
917,747	1,043,681	1,206,956	1,383,115
927,287	848,277	1,130,863	1,178,216
377,681	392,697	514,139	518,662
6,109,077	5,981,209	6,679,220	6,567,361
491,657	365,258	497,385	438,059
89,533	103,950	91,852	100,105
303,445	421,538	467,721	488,594
6,353,318	4,370,189	7,505,585	4,160,265
4,339,989	3,978,967	4,417,861	3,875,801
14,429,401	14,817,234	19,724,995	18,413,080
1,840,596	1,787,163	2,621,854	2,178,539
5,873,574	5,130,383	7,495,498	6,853,456
6,507,677	6,489,883	7,419,936	7,649,702
3,057,377	2,739,505	3,219,246	3,066,797
1,856,625	2,002,860	2,745,525	2,522,549
2,299,630	2,028,657	2,750,840	2,037,699
5,520,118	5,918,017	6,447,187	6,552,316
21,655,304	24,128,684	30,948,460	33,266,171
6,482,693	5,276,155	6,311,793	5,913,274
5,828,576	5,783,293	6,970,957	7,173,830
32,763,817	37,319,784	39,175,869	41,998,217
	13,938,616		16,271,100
	1,774,640		1,859,399
	3,713,751		4,246,057
	12,662,599		13,972,816
	1,963,431		2,305,864
	3,266,747		3,342,981
14,546,175	15,365,001	16,427,065	16,415,422
8,934,078	8,214,656	9,723,972	9,748,830
2,055,590	2,628,216	1,708,167	1,796,746
9,143,900	9,469,305	12,003,575	10,421,408

tion are given. [a] Prior to January 1951, statistics were given on the basis of total weight. [f] Includes data for spreader and calendering-type resins. [g] Includes data for acrylic, polyethylene, nylon, and others. [h] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [i] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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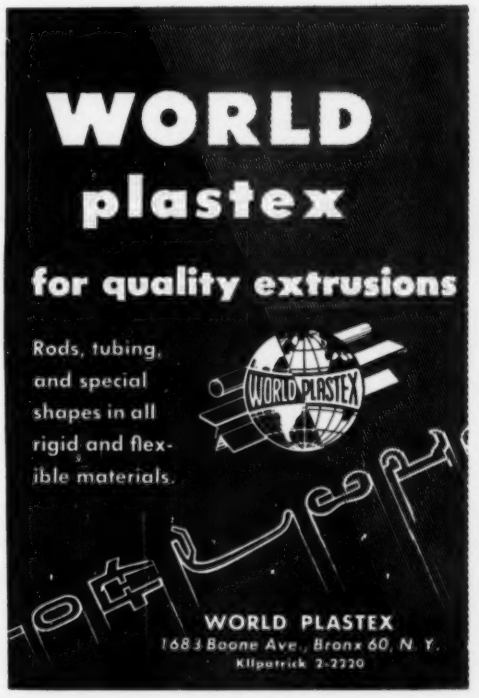

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"CHROMALOX" FAR-INFRARED. Bulletin explains the advantages and flexibility of "Chromalox" far-infrared radiant heating units as a source of heat for curing, softening, or drying plastic products. Specifications included. Edwin L. Wiegand Co. **(C-308)**

"DE-STA-CO" TOGGLE CLAMPS. Brochure illustrates and describes various models of "De-Sta-Co" toggle clamps for use as glueing fixtures and drill jigs and for various other holding applications. Detroit Stamping Co. **(C-314)**

TRIFLUOROCHLOROETHYLENE FILM. Booklet describes the characteristics of "Tri-thene," a trifluorochloroethylene film which is notable for the excellence of its chemical, electrical, and mechanical properties. The Visking Corp. **(C-333)**

AUTOMATIC COMPRESSION MOLDING MACHINES. Bulletin on Baker fully automatic compression molding machines for high speed molding of small and medium size parts from phenolic, alkyd, urea, "Teflon," and other plastic materials. Baker Brothers, Inc. **(C-336)**

RUBBERIZED ABRASIVES. Catalog on various resilient abrasive wheels, points, blocks, sticks, and cones for manual or machine polishing and finishing of molds, dies, castings, gatemarks, and the like. Cratex Mfg. Co. **(C-339)**

Any of the booklets described here plus many others—forty-four in all—are available for the asking, without charge or obligation.

Just turn to the Manufacturers' Literature page in this issue (it's printed on heavy colored paper), circle the numbers corresponding to the booklets you want, fill in the reply postcard, and mail. No postage needed.

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A Breskin Publication

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Vinyl Surfaced Wall Covering

THE ability to resist shrinkage to a degree unobtainable with flexible upholstery-type wall coverings is an outstanding advantage claimed for a semi-flexible vinyl surfaced wall covering recently developed by Bolta Product Sales, Inc., Lawrence, Mass.

The material, called Bolta-Wall, consists of a tough outer layer made of Vinylite resins, pressure laminated to a rubber-saturated paper backing. The outer layer is 0.011 to 0.013 in. thick and the backing is 0.025 to 0.030 in. thick.

Tests conducted on the material by subjecting it to a wide range of temperatures over a 30-day period, resulted in a maximum seam contraction of less than 0.01 in.—scarcely noticeable to the naked eye. This excellent dimensional stability is the result of a carefully researched formulation, characterized by a lack of plasticizer volatility and migration, that goes to make up the surfacing material.

Bolta-Wall is available in two three-dimensional surface textures—bamboo and leather grain—and in a variety of colors. It is offered for home use in two forms—a roll form available to the consumer on an installed basis only and an 8 in. square wall tile for do-it-yourself installation by the homeowner. Both versions of Bolta-Wall can be applied to most smooth, dry interior wall surfaces including plaster, plasterboard, plywood, and hardwood walls.

To install the roll form, adhesive is spread on the desired surface and two widths of Bolta-Wall are laid on so that they overlap at least one in. on the seam. Both layers are cut through at the overlap, excess material is stripped away, and the edges butted together to make an invisible joint.

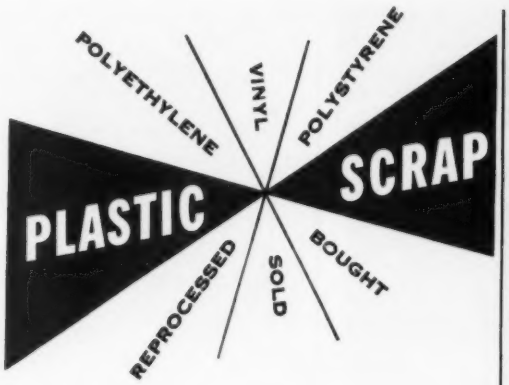
Overlapping widths of wall covering are cut through and edges butted together

Bolta-Wall tile, which is available only in the bamboo pattern, is laid on the adhesive-spread surface with the grain running in alternating cross-wise directions. Each of the tiles is butted closely together to insure a tight joint and then easily pressed into place with the thumb. The tiles cut cleanly for fitting into corners and around fixtures, and are flexible enough to bend around outside corners without cracking or peeling. A color-matched putty is available with the tile.

In addition to dimensional stability, the serviceable properties of Bolta-Wall include resistance to greases, oils, fats, and detergents. The material sheds water and is easy to keep clean by simply wiping with a damp cloth.

Up to six times thicker than waterproof wall paper, the new covering offers maximum resistance to wear. It will withstand scuffing, snagging, or abrasion of any kind and will not chip, crack, peel, or become brittle with age.

Vinyl surfaced tile is easily pressed into place on adhesive-covered wall



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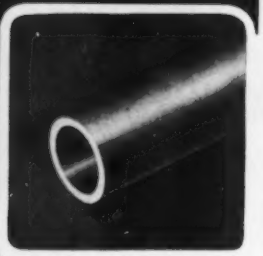
Adjustment strip for a welding helmet headband produced for Fibre Metal Products Co. of Chester, Pa.



Corrosion resistant piping made to order for the Atlas Mineral Products Company of Mertztown, Pa.

Because of the properties required in the custom extruded products shown above, H & R used Kralastic, a modified styrene-butadiene, high in corrosion resistance and impact strength.

H & R offers a complete custom extrusion service capable of turning out the right plastic material in the exact form you need, at a price you'll appreciate. We are fully equipped to make all necessary dies for sheets, strips, rods, tubes and shapes.

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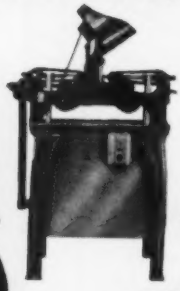

2.

3.

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Plastic window (inset) in lubricator (left) allows clear view of oil level

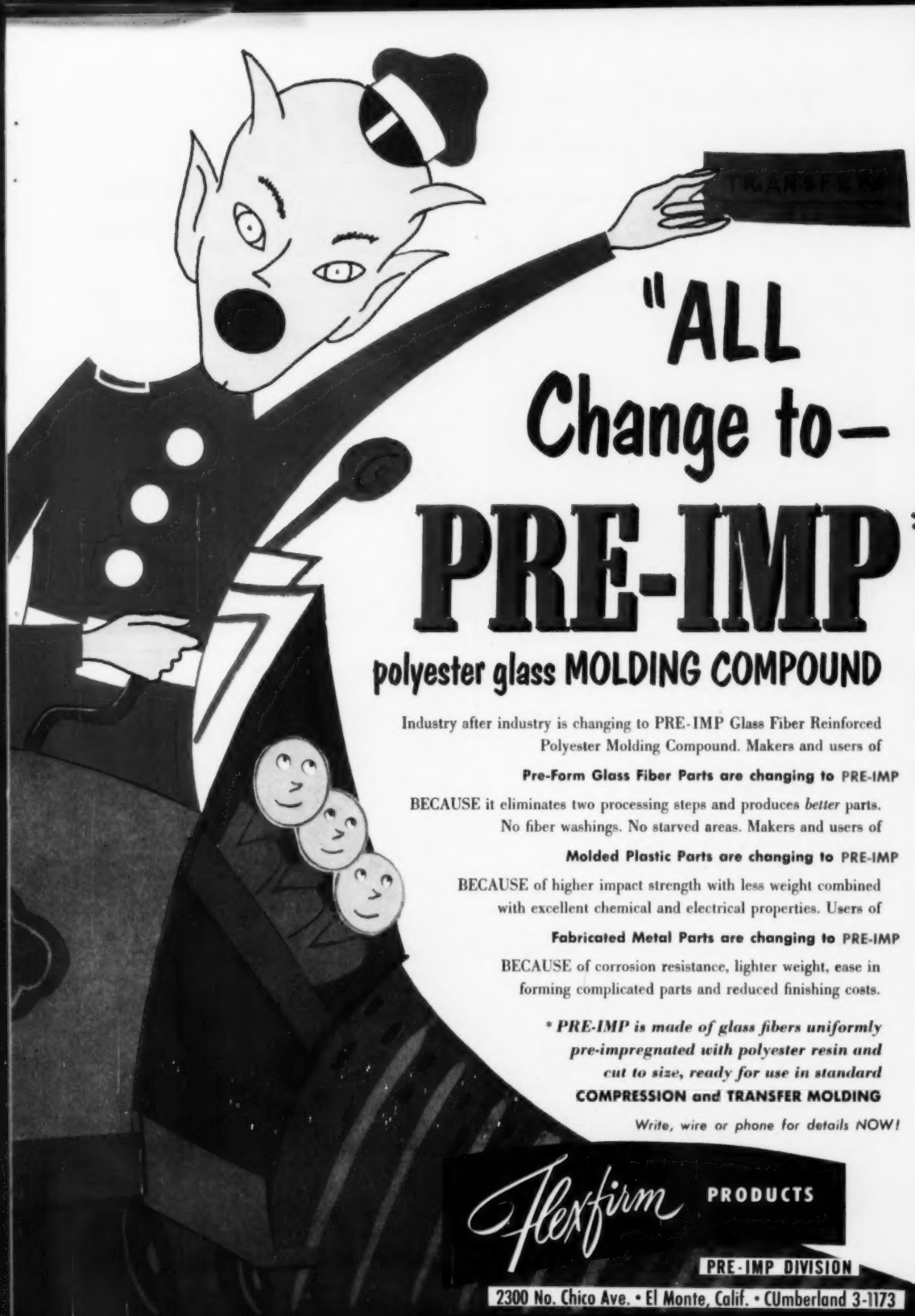
Observation Port

CLEAR windows made of CR-39, an allyl diglycol carbonate manufactured by Cast Optics Corp., Riverside, Conn., permit continuous observation of the oil level in the automatic metered lubrication equipment being produced by Bijur Lubrication Corp., Rochelle Park, N. J. The windows are framed in a circular corrosion-resistant metal rim that fastens on to a side of the lubricator, and are faced so that the amount of oil in the equipment is visible at all times.

Despite the close contact of the optically clear, durable window with oil, solvents, acid, alkalies, and hydrocarbons, it will not craze or deteriorate.

Other applications similar to the oil level observation window are possible with CR-39 crystal material. Installed in the cover or base of any mechanical equipment, the windows can serve as observation ports, lubrication check points, pressure or fluid level indicators, or protective instrument windows. The serviceable properties of CR-39 in the face of rugged wear or contact with corrosive materials enables it to be used on a diverse line of equipment, ranging from machine tools, bread slicers, and air compressors to gear motors and juice squeezers.

The material is supplied in standard sizes up to 60 by 60 in. and 38 by 96 in. and in thicknesses from 0.020 to 1 inch.



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PIQUA, OHIO U.S.A.

Outer edge of the Zip-All loose-leaf binder pocket features an all-vinyl slide fastener. The inner edge has reinforced holes to fit either the large or small binders

Loose-Leaf Binder Pockets

A TRANSPARENT ring binder pocket manufactured by Angler's Products Co., Flushing, N.Y., makes use of the vinyl Flexigrip slide fastener produced by Flexigrip, Inc., New York, N.Y.

Made from Vinylite, the ring binder pocket, called Zip-All, is ideal for students, salesmen, and for home use. It is washable, strong and has reinforced, heat-sealed, tear-proof holes punched to fit standard ring binders.

Utilization of the all-plastic slide fastener renders the vinyl pocket waterproof, airproof, dustproof, and rustproof. The Flexigrip fastener will withstand a pull of approximately 30 pounds per inch without separating.

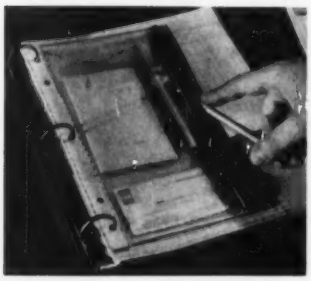
Removed from the binder, the pocket can be used as a pouch or as an air-tight package in which flat objects can be kept.

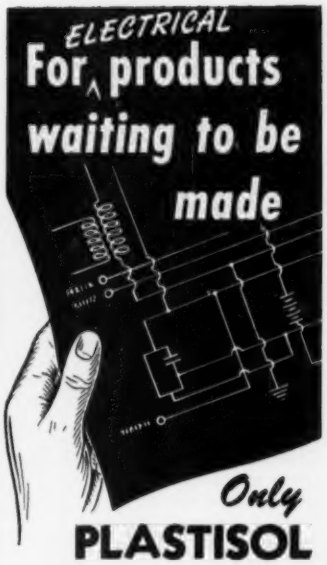
The slide fastener portion of the Zip-All comes in a variety of decorative colors, including green, brown, red, and clear.

The Zip-All can be inserted into any part of a standard loose-leaf notebook. It comes in two sizes: No. 51 to fit small and large ring binders; No. 52 to fit large ring binders only.

An addition to the line of ring binder pockets is the Renick Boggs and Co., Chicago, Ill., product called Zip-Kit. This Vinylite pocket is similar to the Zip-All in purpose. Two tough strips of Vinylite are electronically sealed to form the inner edge. Holes are punched to fit standard two, three, and five ring binders. A metal slide fastener opens up the outer edge of the 5- by 10-in. kit, making removal of contents easy.

Heavy vinyl strips are heat-sealed to form the inner edge of Zip-Kit pocket





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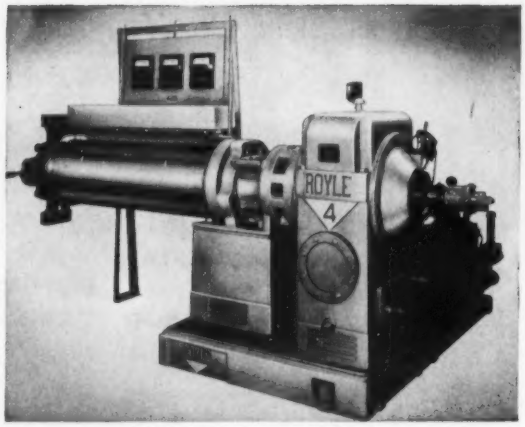

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Compression molded thermoplastic sheet users now have available larger sizes of Acadia polystyrene. These are available in the new size of 36" x 36" x ⅛".
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NEW ENGLAND LACQUER COMPANY
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Soap is easily slipped out from vertically mounted styrene dispenser

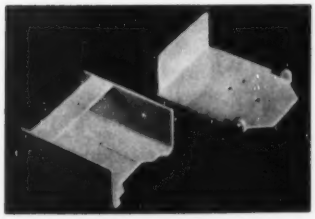
Soap Saver

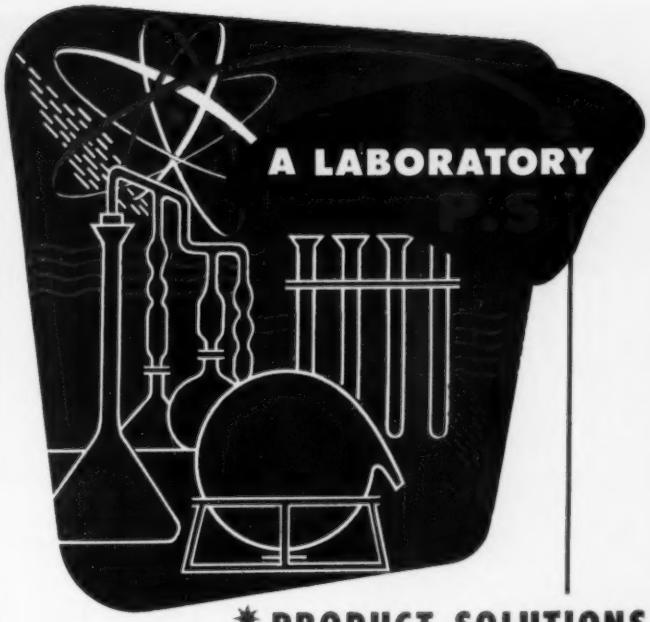
THE traditional horizontal soap dish has been successfully redesigned into a streamlined unit made of styrene which mounts vertically on the wall and holds the soap in an upright position. It is the claim of the manufacturers, Craft-Well Industries, Berkeley, Calif., that the vertical design permits the bar of soap to dry more quickly between each usage and thereby eliminates mess or waste.

The durable ivory-color holder is molded in two parts which are hinged together by fitting a pair of projecting lugs molded-in the back half of the dish into two holes in the front half. When the dispenser is to be used, the soap, which is slipped in through the top, can be removed through the bottom by simply flipping up the front half of the holder with the thumb.

The holder is attached to the wall by a special adhesive that sticks to any smooth surface.

Hinge for parts of soap holder is formed by lugs in back half (background) fitted into holes in front half





✱ PRODUCT SOLUTIONS

successfully developed in the Hawley Laboratories with 6 basic types of Molded Materials that can be varied to meet demands of individual products.

1. **MOLDED CELLULOSE FIBRE, VARNISH IMPREGNATED.** Cellulose fibre, water felted preform molded in compression molding dies. Subsequent varnish impregnation adds strength and stability. Density, 0.80.

2. **MOLDED CELLULOSE FIBRE, BEATER RESIN TREATED.** Cellulose fibre and resin water felted preform molded in compression molding dies. Is light in weight (density 0.75). Has good impact strength plus resiliency.

3. **CELLULOSE AND GLASS FIBRE, BEATER RESIN TREATED.** Cellulose and glass fibre and resin water felted preform molded in compression molding dies. Extremely high strength to weight ratio. Density, 0.95.

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By the incorporation of the drawers into the 13-piece Keynoter series designed for Warren Furniture Mfg. Co., Paterson, N.J., by Edmond J. Spence, recognition is given to the practicality of the units in modern furniture. The drawers were originally developed in the plants of Bakelite Co., Div. Union Carbide & Carbon Corp., New York, N. Y., which also supplies the molding material.

Black phenolic drawers offer attractive contrast to light wood grains

The units are compression molded in one piece of general-purpose wood flour-filled phenolic. The job is done in a single cavity mold by Boonton Molding Co., Boonton, N. J.

Light in weight, the drawers are rugged enough to withstand any abuse encountered in normal household use. They will resist moisture, chemicals, and heat better than wood. Regardless of temperature or humidity conditions, they are less likely to swell and stick. There are no seams or cracks in the one-piece molding to trap dust, and the rounded corners facilitate cleaning.

In addition to serving a functional purpose, the soft-to-the-touch drawers are decorative as well. The lustrous black color of the units in this furniture series offers a dramatic contrast to the three wood grains used. On one piece in the set, a decorative laminate with a pattern to match the Formica top of the piece was cemented to the face of the drawer.

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SHEETS, RODS AND TUBES. Catalog of price lists covers sheets, rods, and tubes made of acrylic, cellulose acetate, rigid and flexible vinyl, polystyrene, nylon, and cellulose acetate butyrate. Cadillac Plastic Co. (C-342)

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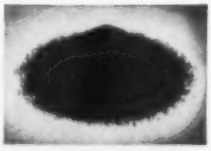

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Fun With Vinyl

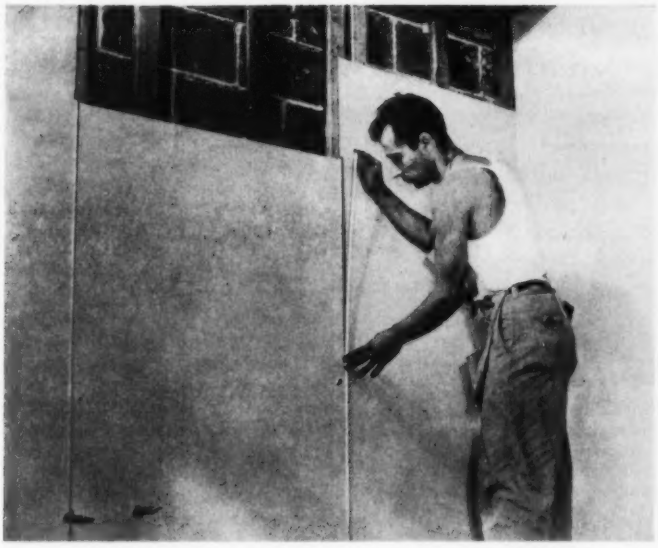
EDUCATION is combined with entertainment in a children's modeling set that offers youngsters—and adults — an opportunity to enjoy the excitement and craftsmanship of working with plastics. By using the kit, which is made by Coventry Ware, Inc., Barberton, Ohio, colorful, rubber-like vinyl coasters, lapel pins, wall plaques, and similar items can be cast right in the family kitchen without fuss or bother.

All of the necessary equipment for the molding operation is contained in the kit. This includes four bottles of liquid vinyl plastisol; four pattern blocks; a stylus; a tamping tool; and sheets of aluminum foil. The plastisol is supplied in red, yellow, blue, and green by American Anode, Div. of the B. F. Goodrich Co.

To make the mold, the child tamps the aluminum foil down against the plaster pattern block until the details of the design are brought out sharply on the foil. After a border has been traced out with the stylus and the foil mold removed, the liquid vinyl is slowly poured in. The mold is then placed in an oven, which has been preheated at 350° F., for exactly 5 minutes. After this cure, it is removed and dropped into a pan of cold water. The finished vinyl item can now be easily stripped away from the foil.

To obtain more than one color on an item, a 5 to 10-sec. warming is necessary between each successive application of color. When all the colors and the background have been laid on, the object is again placed in the oven and subjected to a final 5-min. baking.

To cast vinyl novelties, liquid plastisol is poured into foil mold and baked



Decorative laminate panels, with built-in engineered curves, are held in place by metal molding strips which are nailed to the wooden studs centered behind the joints

Curved Panels Hug Flat Surfaces

FOR architects, builders, and "do-it-yourself" homeowners, decorative laminate paneling for simple yet permanent installation without the use of adhesives is now available.

The 1/10 in. thick panels, produced by Panelyte Div., St. Regis Paper Co., New York, N.Y., are designed with a built-in engineered curve in the face of the material that makes the laminate hug any flat surface—new as well as old—to which it is attached. When installed, the panels are held in place by the lips of metal molding strips which are nailed to wall studs or the back-up material.

Both vertical and horizontal laminate surfaces can be covered with this new material for a wide variety of applications that range from drainboards, backsplash areas, dinette tables, and vanity tops to kitchen and bathroom walls.

When installed in vertical wall applications, the panels are positioned so that the wooden studs are centered behind the joints of the panels. The panels are then anchored to the wall by means of long metal strips nailed vertically along the studding. These strips double as molding tracks for matching snap-on moldings which cover the joints and give a finished appearance.

In horizontal counter applications, a cove molding is placed flush against the wall and fastened securely to the counter base by nailing through the flange of the molding. The panels, which have been cut to size with a keyhole or coping saw, are then slipped into this molding and the front edge secured by applying overlap-type molding screwed or nailed in place.

The hard-to-mar melamine surface of the panels gives maximum resistance against scratching, stains, or other damage. It will not peel, chip, crack, or dent and is not affected by various beverages or foods.

Simply wiping the surface of the laminate with a damp cloth is sufficient to keep the panels clean. Soaps or detergents can be used, however, without damaging the color or the finish.

The panels are made in a series of 11 colors and patterns in both glossy or satin finish. Stock sheet sizes are 48 by 96 in. and 30 by 120 inches.

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Manufacturers who want a shiny high polish or a rich matte finish on their vinyl sheeting can eliminate the necessity of an extra polishing run on an embosser by adding a Liberty Polishing Unit to their calender. The Liberty Polishing Unit works its magic equally well on virgin and reprocessed materials.

This hydraulically powered unit is made in widths from 39" to 84", and is synchronized in with the calender. It actually increases production . . . because it may be used to *decrease* the gauge of the material as it comes from the calender and polish it in a single operation. An operator is not needed.

Liberty Machine Co. also makes high chrome cylinders, embossing machines, printing presses, inspection units and other equipment for plastic sheet processing. Write for details on these units. LIBERTY MACHINE CO., INC., 275 Fourth Avenue, Paterson 4, New Jersey.

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Laminate Label

FOR the consumer or retail salesman who might be confused by the welter of color patterns and wood grains offered by the many producers of decorative laminates, The Formica Co., Cincinnati, Ohio, has contributed a constructive move toward the positive identification of particular brands.

Laminates manufactured by this company are now easily identifiable by a printed label spanning each sheet. The legend on the label, appearing in an attractive repetitive pattern, includes the company's name, a seal of approval, and instructions to the consumer for removal of the printing with soap and water.

The identifying label is printed on the laminate sheets during production and is not removed until the finished goods reach the ultimate consumer. The application of label involves a separate handling operation and is accomplished by means of special printing equipment designed and built specifically for this use.

The formulation for the water-soluble ink that is used in the printing was also developed after much experimentation. It dries instantly on application, thereby eliminating the expensive and difficult problem of slip sheeting. The label will stand up under all of the various forms of fabrication, including veneering in regular veneer presses and in hot presses.

Decorative laminates can be identified by label printed across each sheet

Batteries

(Continued from pp. 73-9)

rators and is furnished with the Televel vent plug which is described above.

Gould has recently begun delivery to the U. S. Air Force of one of the largest styrene housed batteries so far produced. The transparent case, molded by General American Transportation on a 300-oz. Watson-Stillman machine, weighs 8 lb. 6 oz. and measures 12⅛ in. high, 11 in. long, and 8½ in. wide. The battery is used in jet fighter planes.

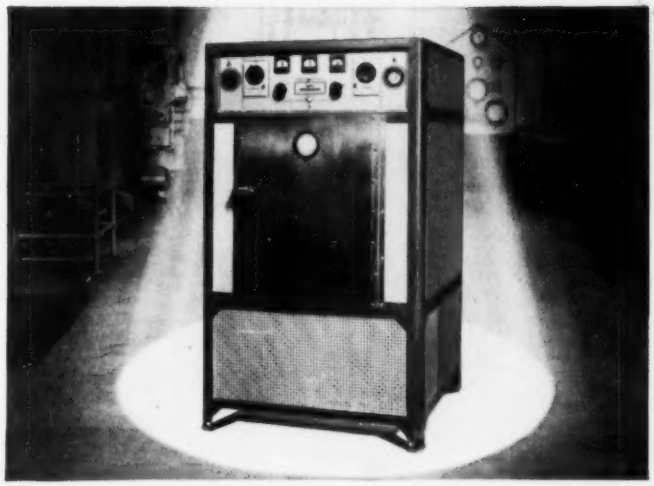
Mercury Cells

General Dry Batteries Inc., Cleveland, Ohio, is marketing a line of mercury cells which are finding wide application in hearing aids, photoflash use, and as radio B batteries. A short length of polyethylene tubing is used as an insulator between the negative shell and the positive portion in one class of these batteries, replacing a special thin paper formerly used for this purpose.

In the General B batteries, the mercury cells are placed in thin saran film cups which have small holes punched in the bottoms so that contact can be made between cells. The cells are placed one on top of the other in a metallic tubular shell which forms the negative portion of the battery. Insulation between the inner walls of the outer shell and the mercury cells is a spirally wound oriented polystyrene film.

More to Come

As automobile production climbs, the demands for new and replacement batteries will increase in like measure; as more and more portable radios are produced, more and more A and B batteries will be required; as industrial uses of storage batteries become bigger, better batteries will dominate the market; with wider acceptance of hearing aids, more efficient power sources will be expected. Planes, tanks, trucks, trains, telephone systems, flashlights, photographic flash outfits, and a host of other users of portable power need more and more reliable power sources. Batteries will supply these requirements . . . and plastics will play a prominent part.—END



All through the Night

WEATHER-OMETERS

like this are operating unattended in hundreds of industrial laboratories to determine the resistance to rain, heat, sunlight, and thermal shock of a wide range of materials intended for outdoor use.

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Fire Destroys

(Continued from pp. 86-8)

placed on the opposite side of the press room parallel to the outer wall of the building. For reference in following explanations, the No. 1, 12-oz. press was approximately 10 ft. from the rear wall of the press room, the No. 2, 12-oz. was 8 ft. farther toward the front of the press room, the 8-oz. press was another 8 ft. further on, and the No. 3, 12-oz. 8 ft. past that. This placed the No. 1, 12-oz. directly under the room in which the fire originated and adjacent to the drying oven located on the rear wall of the press room, at the northeast corner.

Presses Cut Off

Upon the start of the fire all presses were immediately cut off, but the platens were closed on the No. 1, 12-oz. press with a die in place. All other presses had dies installed but were left open. During the course of the fire, the upper floor collapsed and the entire burning mass fell onto the presses below. The steel beams supporting the upper floor also collapsed under the heat and weight and fell onto the presses. The effects of the falling beams were noticeable only in the bending of the door frames and light structural braces on the presses.

The electrical systems of all presses were completely destroyed. The control panels were gutted until only charred copper remained and the control box itself was warped badly in every case. Time clocks were completely destroyed and there was absolutely no salvage value to any of the instruments, either clocks or pyrometers. The coils of all solenoids were completely burned but the frames were found to be usable after new coils were installed. The motors could not be turned over after the fire and required complete rewinding. In one case an entirely new rotor was required for the motor due to distortion caused by the heat. This motor was installed on the No. 1, 12-oz. press. The motors also required new bearings in most cases and oil seals in all places where used. The frames of the motors did not seem to be adversely affected and, with the exception of the No. 1 machine, the main shafts were usable. Testing of the electric resistance

heater bands after the fire showed them to be good, but when put into use the bands broke down their insulation at a temperature of about 500° and grounded out. It was necessary to replace all of these units.

Physical damage to the main structures of the press seemed to be of a minor nature in spite of the fact that the completely melted feed chutes, solenoid covers, and front control panels of aluminum indicated a temperature of approximately 1200° F. It was deduced from obvious effects that some of these heats were localized, but the primary reason for the larger press members being uninjured was felt to be the large mass of metal in the parts and their ability to absorb a great amount of heat with a lower rise in temperature. Although the fire lasted for several hours the actual exposure of these parts to the higher temperatures was probably of much shorter duration. Of course if the exposure had been of a sufficiently long period these parts would have been likely to have shown distortion to a noticeable degree.

Frames Still Aligned

There seemed to be no change in alignment of the frames of the machines. The tie bars were uninjured on all of the presses with the exception of No. 1 which showed a slight bow of a few thousands in each of the bars. These were later straightened satisfactorily. Main cylinders were not damaged in any way with the exception of packings and gaskets which had to be replaced. The piston rings seemed to have retained all of their spring and continued to show satisfactory results after the presses were returned to use. The die plates showed no misalignment and the brass bushings were usable in all but the No. 1 press. Oil seals were replaced on all presses. The toggle mechanisms seemed uninjured and the main bearing pins tested 50-55 on the Rockwell C scale as compared to original specifications of 40-43. All bushings in the toggle mechanisms were usable with the exception of those on the No. 1 press, some of which were distorted and required replacement. The heating cylinders seemed undamaged both externally and internally. Feed hoppers were not affected except where bent by falling beams. Oil tanks exhibited no leaks. Oil was

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found in all presses after the fire.

All smaller bars and angles suffered distortion from the heat and the sheet metal covers were warped badly. All control handles were melted completely and the main shaft of the die speed adjustment wheel was warped to an angle of about 20° immediately behind the wheel in one case. The Bijur lubricators were destroyed and their aluminum case melted and dripped down over the rear of the press. All of the locking knobs used on the moving platen for pulling the stationary platen were melted.

Hydraulic System Damage

The hydraulic system of the presses fared better than might be expected although there were a few exceptions. In most cases the larger valves suffered less damage, presumably due to the mass of metal involved. In general, all springs, gaskets, and oil seals on valves had to be replaced. The springs lost their tension due to the heat and were ineffective for further use. It was found to be advisable to replace one or two of the smaller valves because of the tightness that had resulted from very slight spindle distortion. All valves and all piping had to be completely disassembled, cleaned, and repolished to remove scale and charred oil deposits within them. All piping was usable with the exception of one or two sections which split during the fire. Cleaning of the pipes was accomplished by the use of a descaling bath with subsequent rinsing and blowing out.

The pumps were not damaged as badly as might be expected although one or two new rotors were installed to replace those which appeared to have been slightly distorted. The vanes were usable in every case but the brass bushings as well as the ball bearings were replaced in most cases. Rings were replaced in most pumps more as a matter of maintenance than because of actual damage. The main shafts seemed to be unaffected as did the outer frames. The high pressure pumps were in most cases exposed to the heat more than the low pressure by virtue of their location and most of the few troubles met were in these units.

With the exception of the Ross Cooler on the 32-oz. press, the others were tested, repaired, and proved to be not seriously damaged. The strainers in the tanks were not affected although they required complete cleaning to remove the charred sludge of the oil. All of the oil tanks had to be completely scraped clean and refinished.

These machines were moved to another location and, one at a time, were completely disassembled, cleaned, and rebuilt by Kusan personnel exclusively. The first 12-oz. machine was completed in three weeks, the second in two weeks, and the worst one, the No. 1 machine, required almost four weeks. The others are currently in the process of repair and should be completed in approximately four to five weeks for the 32-oz. machine and two weeks or less for the 8-oz. machine. Each length of time mentioned includes all procurement of parts as well as actual work.

Care by Firemen

It should perhaps be noted that the reason the No. 1, 12-oz. machine suffered considerably more damage than the others was partially because of its location and partially because the firemen played water on

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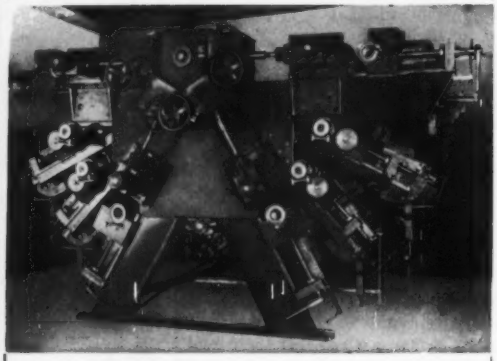

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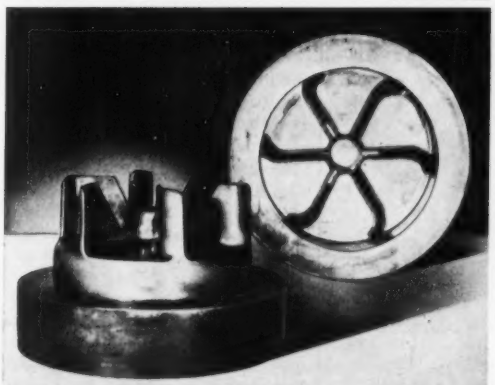

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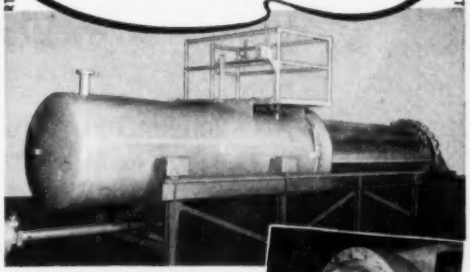

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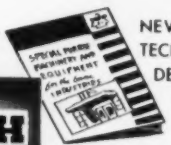

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it during the early course of the fire. They were asked, after this first occurrence, to carefully keep all water off the other presses and dies.

Other equipment of an auxiliary nature was also involved in the fire. Among these were air compressors, regrind machines, Thermolators, color blending machines, and small shop equipment such as drill presses, grinders, etc. The effects varied for the different types of equipment. The Thermolators were a complete loss with nothing of value being salvageable. The regrinding machines could be reclaimed with the installation of rewound motors, new blades, bearings, and possibly a new casting on one machine. The air compressors were completely rebuilt and returned to operation. The recovery of these required much the same work as the injection presses, with none of the major members of the tanks being affected seriously. The smaller equipment was not deemed to be economically salvageable.

Die Damage

Also of major importance in considering the effect of the fire were the 63 dies involved. These had a combined valuation of approximately $200,000, and, as is the case in every injection molding plant, they represented a high percentage of the fixed values present. Among the dies used in the shop practically every type of construction was represented. These included cam operated dies, air cylinder side pull dies, dies with long thin sections, dies with large flat areas, beryllium castings of large and small sizes, and several large wedge and double wedge dies. There were five dies on machines at the time of the fire and all were open with the exception of the one on the No. 1 press. There were several open dies on tables in the shop located in the northwest corner of the press room. The remainder were stored in a die rack constructed of 2-in. angle iron with four levels of storage. This rack was located outside the shop and about 10 ft. from the north end of the 32-oz. press. This die rack remained standing after the fire and in addition to the weight of the dies was supporting the steel beams which had dropped from above. The rack itself showed very little distortion and none of the dies fell from it during the fire.

In general, all the dies had a black

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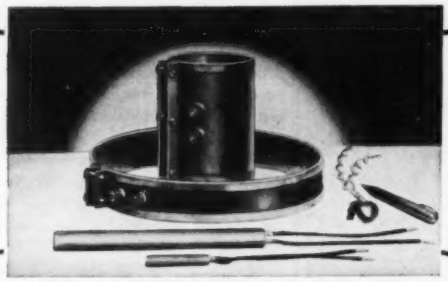

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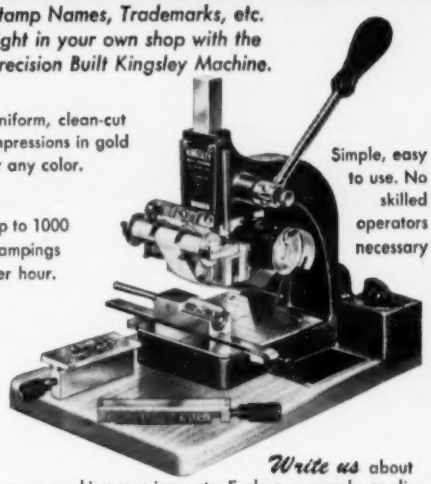

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film over their cavity and core surfaces due to the burning of the oil to carbon. Those which were open on the presses were also badly blackened. Those which were open in the shop were subjected to the additional heat of the burning debris falling from above. The dies in the rack were all closed and showed less effects than the others, in fact one or two still had the storage oil or grease on their inner surfaces and required little polishing.

All dies were removed immediately after the fire and opened for inspection and necessary repair. It was found that there was little damage of consequence although the task of completely disassembling, cleaning, and rebuilding such a large number of dies was a tremendous task. There seemed to be a slight softening of the surface on a few of the dies that were open on the presses and all wear plates for moving parts were rehardened. The smaller punch out pins in the die on the No. 1 press had to be replaced since they had softened considerably. The relatively slight softening of the cavities and cores of the dies which were open had little effect on their function in later use except where wear was incurred due to sliding friction as in stripper rings. None of these troubles occurred on dies which were closed.

Restoring Luster

One of the major problems was to restore to original luster all of the cavity and core surfaces. The black scale of the surfaces in some cases was almost impervious to removal with diamond polishing alone. In order to expedite the work where so many parts were involved and time was of such importance, the parts were briefly immersed in a weak solution of phosphoric acid to break the black scale and then given a soda ash neutralizing bath to stop action of the acid. This aided materially in reworking the dies without damaging the parts. All dies were then polished with diamond compounds and returned to use. Many of them have been running almost constantly since the date of the fire and show no ill effects. The beryllium copper cavities required much less work in reclamation and did not have a black scale formation on their surface, probably because of their different thermal conductivity characteristics.

Conclusions as to the relatively small damage to dies again return to the premise that the larger masses of metals absorbed the heat and did not rise to a temperature sufficiently high to seriously damage them.

There were only minor amounts of solvents in the building at the time of the fire and these were stored in small safety cans. However, there were several empty and several full drums on the rear loading platform. These contained, or had contained, acetone, toluene, and dimethyl phthalate. After-results of the fire showed that the full drums seemed to be less affected than the empty ones. Evidently the empty ones had small amounts in the bottom which were vaporized into a gas that broke open the top of the drums when it expanded. The full drums seemed to have absorbed the heat better and did not exhibit the same violent effect.

The effects discussed above seem to provide some grounds for consideration in arriving at a sensible insurance program for the various components of an injection molding

problem

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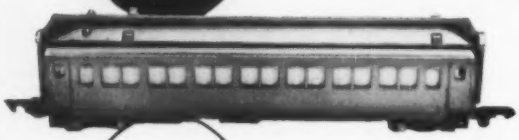

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plant. There seems to be a lack of sufficient information on the plastics industry that is readily available to the insurance adjustors and the infrequency of such occurrences makes their experience most limited in dealing with settlements. The materials are fairly straightforward but the dies and specialized machinery, representing such high unit costs, present a problem that could better be solved, it is felt, if expert advice were made available to the adjustors at the time of such losses. It might be well to have one of the industry organizations offer the services of a competent advisor that could work with the adjustors on behalf of the companies.

Lessons Learned

The amounts of insurance to be carried by an injection molder on these various types of investment is a question which must be individually decided. In view of the above experience it would seem a natural course to provide an outside, separated storage area for dies and to carry a minimum insurance coverage sufficient to reclaim any dies which might be in a plant at the time of such a fire. If the outside storage is of fireproof construction, full coverage does not seem to be necessary. Kusan, in its new plant layout, is providing for such a die storage building as well as for a separate material storage building. The main operating plant and the materials storage warehouse will be completely protected by a sprinkler system making the maximum protection possible at the lowest cost to the molder.

Fire in any form is a costly menace and it is hoped that the experiences and results that Kusan has had will prove of value to the industry—particularly in emphasizing that good housekeeping and every safety precaution possible is the best insurance that can be bought against destruction and disaster.

We would like to take this opportunity to express our sincere appreciation to the materials suppliers, machinery manufacturers, and the many molders who acted instantly to let us know that they were ready to help in every way possible. Their cooperation and unselfish aid were a real credit to our industry, and made possible our rapid recovery from a rather severe disaster. END

Basic Principles

(*Continued from pp. 103-7*)

than in conventional molding but along the same cooling line that will give a good molding. Since this packing period is much shorter than in conventional molding the residual strains in the molded piece are much less.

Conclusions

The plastic temperature and pressure in the mold are the main quantities that control the quality of the injection molded article. These two quantities are determined by some complex arrangement of the primary control variables listed in Table I. Therefore it would be of value to the injection molding machine operator to know and be able to control directly the pressure and temperature in the mold. Since this is not possible at present, the authors have tried to analyze the various controls and mechanisms available to determine how these controls are related to the pressure and temperature in the mold. It has also been shown how the quality of the molded article is dependent upon the pressure and temperature in the mold. It is the belief of the authors that a more exact knowledge of what happens during the injection molding cycle will aid the molder in solving many of his injection molding problems.

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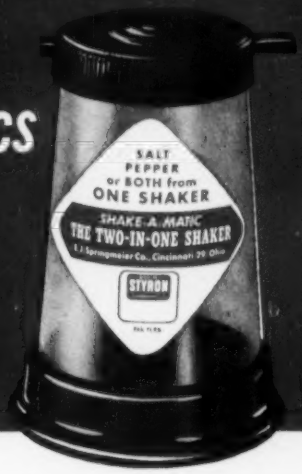

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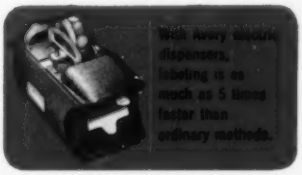

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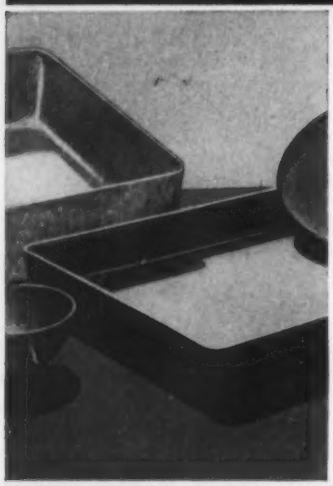

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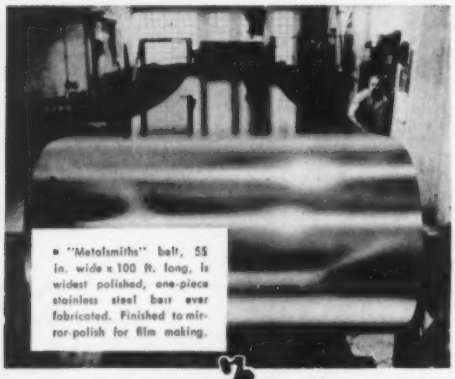

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Glazing

(*Continued from pp.* 119-124)

The experiments described above only permit the choice of the minimum temperature at which hoods should be annealed, that is, the temperature below which the stress level remaining in the material will remain higher than is desirable. As the temperature is raised above this minimum the increased tendencies of the methacrylate to revert to the flat shape and to deform under its own weight become serious. Since these depend on the dimensions and earlier thermal history of the canopy the maximum safe temperature can only be determined for each separate design and method of production of that design. In the case of large shapings deformation may be experienced at a temperature below that required for adequate annealing. It then becomes necessary to apply constraints to maintain the required profile. This is being done by what is virtually a second molding operation using the greased mold technique. Spring clamps are used to hold the shaping in position; they allow normal shrinkage on cooling. The effectiveness of this treatment in reducing the incidence of crazing has been demonstrated and this may be taken to indicate satisfactory annealing. In the case of a free-blown shape the application of internal air pressure may alternatively be used.

Double Shell Canopies

A few points on double shell as against single shell canopies will be dealt with in so far as the question affects the materials employed. The choice between the two types of construction arises from the methods available for de-misting and de-icing canopies to maintain adequate visual qualities. Mist or frost will form on a surface when its temperature is below the dew point of the air in contact with it. This may happen on any of the surfaces involved. The heat input needed to keep the inner face of a single skin canopy above the cabin dewpoint is considerable. The possible presence of hot spots in the plastic may be serious. For given cabin and external temperature conditions the temperature gradient through a single shell is of necessity much steeper than that through either component of a double shell.

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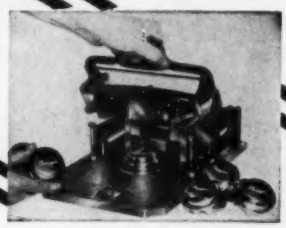

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Both hot spots and steep temperature gradients are undesirable because they increase the stress in the load bearing component.

In many double shell canopies it has been the practice to cement the edges of the two shells firmly together making one single unit. Differential contraction and expansion of the shells are thus completely prevented. A temperature gradient through the canopy may cause high stresses at the junction of the shells. Such a canopy is also difficult to manufacture because of the need for accurate mating of the component parts. Both these drawbacks are avoidable by suitable flexible connections of the shells or their independent attachment to the mounting frame. An added advantage of the latter arrangement is that in the event of accidental breakage of either shell the other would generally be capable of carrying the applied loads with a reduced safety factor.

A property of the material of interest to this discussion is its permeability to moisture vapor. Lack of accurate data has prevented any calculation of the dew point within a nominally dry air sandwich at any given part in its history. Recently a paper by Thomas (4) has given values for the permeability and diffusion constants of thin films. Check tests on thicker material are difficult experimentally but tend to confirm the order of magnitude obtained. The rate of increase of pressure in an enclosed space on the dry side of a methacrylate sheet may be shown diagrammatically (Fig. 8). It is assumed that the sheet is initially dry and is then exposed on the other face to an atmosphere containing a constant pressure of water vapor. The delay period, L, which is the intercept on the time axis of the steady state of flow, is given by

$$L = \frac{h^2}{6D}$$

where h is the thickness of the sheet and D the diffusion coefficient. For ¼ in. Perspex at 30°C., L is of the order of 43 days. It should be noted that within limits this is independent of the external humidity. From the value of the permeability coefficient, P, the dew point at any given time within a defined air sandwich may be calculated. For example, consider a sandwich of two sheets of ¼ in. "Perspex" separated

by an air space ½ in. thick. Figure 10 shows the time for a given dew point to be reached for saturated conditions at 30°C. outside, the time being measured from the end of the delay period. Compared with this delay it is of a lower order of magnitude. The significance of these results is that the saturation vapor pressure at sub-zero temperature is so low that as soon as any appreciable transfer occurs the dew point rises abruptly. Hence for aircraft flying to high altitudes after standing on the ground there is a definite risk of misting. Dry and/or warm air needs to be circulated positively through the sandwich.

New Materials

The question of the use of the newer materials and of future prospects will now be considered. The problems set to the chemist are difficult to solve by a fundamental approach and it is evident that much work of an empirical character is required. Although considerable advances have been made, there is no great store of information on the relation between chemical structure and mechanical properties. Whilst he can make a reasonably good guess, the chemist has not yet sufficient knowledge to synthesize a material of predictable properties. The phenomena of fracture and of adhesion, which so frequently come into discussions of this type, are but little understood.

Strength — Although increased strength may be desirable, we have already seen that the present materials are very inefficiently used. Nevertheless it is instructive to consider in general terms how strength can be improved. Crosslinking of the long chain molecules by primary valency linkages resulting in the formation of a network structure is the first and obvious choice. The process raises the softening point and may make the material unformable by present methods or only formable with the production of undesirably high internal stresses. A two-stage process would be much more convenient if crosslinking could be induced in a solid resin during forming. The idea of casting and possibly machining complex shapes appears to involve insuperable engineering difficulties.

Strength may, secondly, be raised by increasing the interchain dipole forces as has been done in the case of polymethyl alpha-chloroacrylate. This material does seem to hold out very real hopes of the production of shapings for aircraft capable of flying at much higher Mach numbers and withstanding the kinetic heating involved.

Thirdly, the molecules of a polymer may be oriented to some extent, a process which generally increases the strength and ductility in the direction of orientation.

Fourthly, crystallization of a polymer can materially increase its strength but at the cost of a reduction in transparency by the production of light-scattering nuclei.

Finally, it has been suggested that the incorporation within a resin of a transparent reinforcing material, such as glass, might be feasible. It is possible to match the resin-glass refractive indices at a chosen wavelength of light by a suitable copolymerization but matching is imperfect at other wavelengths. The material so produced ceases to be truly transparent at extreme temperatures because the temperature coefficients of the refractive indices are not also matched. Under stress, discontinuities may be produced at the resin-glass interfaces. Moreover, the softening of the resin at high speeds remains a problem in this case.

Transparency—The maintenance of transparency and freedom from color should not prove so difficult a problem. Care should be taken to avoid chromophoric groups, which under the action of ultra-violet light or of oxidation yield colored products, or high chain regularity, which would permit crystallization.

Softening Point — The softening point of a polymer is affected by those factors suggested to improve the strength, so that crosslinking or high interchain forces also result in improved resistance to softening under heat.

Other Properties

Mention may be made of a few other properties. It has already been demonstrated that crazing, though a general phenomenon, may be delayed until much higher stresses are applied than is the case with methacrylate. Improved scratch resistance is desirable but should be obtained as an intrinsic property and not by merely surface coating a softer substrate. In this case severe

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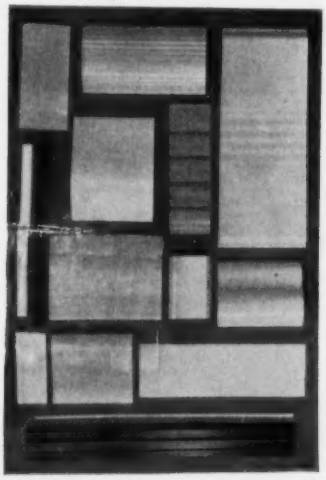

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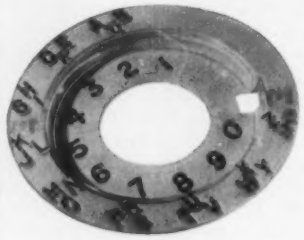

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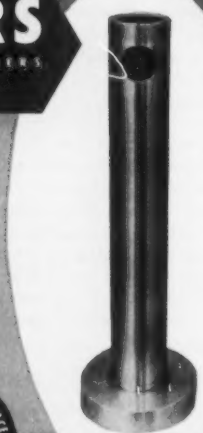

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scratching when it occurs is nearly impossible to remove satisfactorily.

The desirability of using laminated materials to diminish canopy vulnerability has already been extensively discussed. Mention may be made of some work that has been done following that of Bartoe (5) on the Izod impact testing of laminated Plexiglas (Fig. 10). The curves obtained were similar to his for polyvinyl butyral interlayer; a rubber interlayer was also tried in order to try and elucidate further the required properties of the interlayer. It will be noted that the whole curve was displaced to lower temperatures without greatly widening the range of usefulness. The results are difficult to interpret because such factors as adhesion, tear initiation, and propagation in the interlayer are involved. While it is considered essential to raise the upper limit of the temperature scale to permit adequate forming of the acrylic, the lower end may be less vital. A double shell canopy with an outer layer of polymethyl alpha-chloroacrylate to give resistance to kinetic heating and an inner laminated shell for protection against missiles would by separating these functions make it possible to use the interlayer always within its optimum temperature range. It is, of course, highly desirable to get away from a plasticized interlayer material with its inevitable crazing risk on the plastic and severe limitation on the working stresses that may be used.

The author wishes to express his thanks to many of his colleagues upon whose results he has freely drawn and to the Chief Scientist of the British Ministry of Supply for permission to publish this paper.

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Heat Loss

(*Continued from pp.* 126-8)

can be obtained by use of multiple panels. The effectiveness of these assemblies lies primarily in the increase in the number of surfaces; the resistances of the dead air spaces and of the material become secondary factors. As a result, the thermal advantage of Plexiglas is reduced and there is little difference between the heat loss through multiple panels of acrylic plastic and those made of glass.—END.

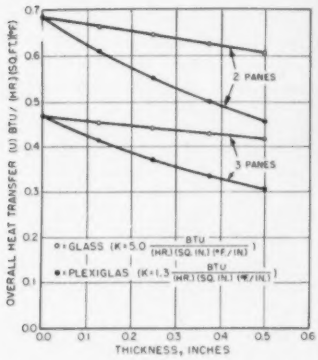
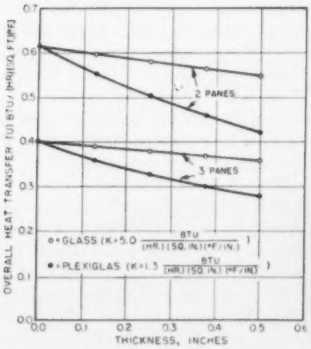


Fig. 7—Calculated heat transfer through multiple panes separated by ¼ in. wide air spaces with 15 m.p.h., 0° F. air on one side and 0 m.p.h., 70° F. air on the other side, versus panel thickness

Fig. 8—Calculated heat transfer through multiple panes separated by ½ in. wide air spaces with 15 m.p.h., 0° F. air on one side and 0 m.p.h., 70° F. air on the other side, versus panel thickness



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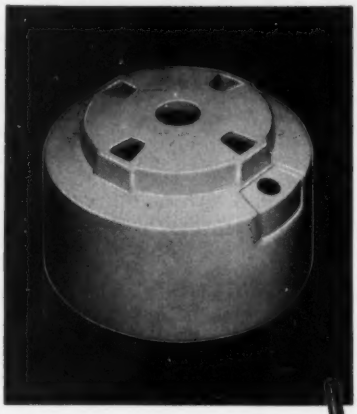

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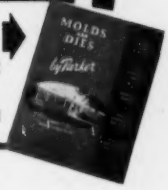

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NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Polyethylene Tape

IN January 1951 this magazine printed an article entitled "Test Report on Revolutionary Tapes," which many authorities believed to be the forerunner of one of the more significant developments in the plastics industry. This article dealt with the production of calendered, oriented polyethylene film to which was attached an adhesive, and it thus became a pressure-sensitive polyethylene film adhesive tape.

It is no secret in the industry that this same method could be used to produce oriented polyethylene film or sheet without the addition of an adhesive, but since the Polyken Division of Bauer & Black, developers of this method, were initially much more concerned with tape than with film, the process has been used up until now almost entirely for adhesive tape.

In a recent, exclusive interview with an official of the company, MODERN PLASTICS was told that development of this program has been deliberate and conservative because of a shortage of polyethylene and a certain amount of time required to install equipment. The company has had to plan ahead for large scale production which is now under way. The company plans to market this tape in three major volume fields, all of which are predicated on the unique characteristics of oriented polyethylene—its elasticity; its superb properties as a moisture-vapor transmission barrier; its appearance; and its electrical properties.

Anti-corrosive tape: The first item is a tape which will be furnished as a protective coating for mitigation of corrosion on metallic surfaces. For example, it will be used as a pipe wrap in the petroleum and chemical industries and on utility companies' conduit where it has been found superior to commonly applied protective coating materials.

Electrical tape: The second outlet is expected to be as an electrical tape where it will enter the field in competition with vinyl tape and the conventional rubber splicing compound-friction tape combination.

Full acceptance of plastic film electrical tapes (vinyl or polyethylene) by electricians may take some time because these are new tapes requiring education of electricians in new taping methods. Plastic film tapes can be applied quicker and more efficiently than the old style rubber-plus-friction tapes because the splice is made by wrapping one material instead of the double work of wrapping two components.

Household tape: A third line of tape to be put out by the Polyken Division of Bauer & Black eventually will be a consumer tape that will be furnished in a household form but can be used by amateurs and others to replace friction tape. It will have many other uses than electrical wire wrapping. It is possible that this material will be put out in a variety of colors and will be widely used in the home for decorative effects; for sealing packages; for sealing bottles or jars in the home canning process; for weather stripping; and for certain types of masking.

Bauer & Black are very cagey about saying just when all this is going to take place, and are very modest in their estimates on volume to be attained in the immediate future. But don't be surprised if within two years this material becomes as well known and as widely used as any tape on the market.

Polyethylene Supply

MOST confusing news in the plastics industry today seems to be the situation in polyethylene. Only one thing appears to be sure—the supply is tight. Old customers of polyethylene producers are receiving as much material as ever before, but not enough to fill their demands. In addition, the woods are full of prospective new customers for polyethylene. These new customers cannot obtain nearly enough polyethylene to get their business going on a substantial basis because they have no past history of consumption. Suppliers are furnishing polyethylene to their customers on an allotment system which is predicated on past usage.

How much more in 1953: Today's production capacity for polyethylene flake has been estimated as between 10 and 11 million lb. a month. Some time in the first quarter of 1953, perhaps before this item appears in print, Du Pont will reportedly start producing on equipment that will turn out several million pounds a month more. In the third or fourth quarter, Bakelite will bring in enough additional capacity at Texas City to make the total monthly production of all polyethylene by the end of the year something like 19 million lb. a month. The new Bakelite plants at Seadrift, Texas, and Los Angeles, Calif., each announced as of 50 million lb. capacity, will not be ready until late 1954.

There has been much talk in the trade concerning the possibility of two other producers coming in with small amounts of polyethylene this year. Rumors imply that Texas-Eastman will have a small amount available within three or four months from now, but insofar as we can find out, this is highly exaggerated and Texas-Eastman is mum on the subject. We will still back our guess of last January that Texas-Eastman will not be ready to supply an appreciable amount until 1954. There has also been talk that Semet-Solvay is now producing small quantities of high molecular weight polyethylene, but company officials deny the story and say that the only thing they have to talk about is pilot plant production of modified low molecular weight polyethylene for waxes. There are probably many other rumors scattered through the industry, but we will stick to the statement that the only people from whom it will be possible to buy any appreciable sized quantities of polyethylene in 1953 are Bakelite or Du Pont, with some possibility of small quantities of imports.

Many companies interested: There are many other chemical, rubber, and petroleum companies involved in

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this speculation on future polyethylene producers, but it seems impossible to believe that any of them can be ready to start producing in 1953 in any sizable quantity. There is great doubt that they could get going even in 1954. The best opinion we can muster is that by early 1955, total annual polyethylene production capacity will be between 350 and 400 million lb., divided between Bakelite, Du Pont, and Texas-Eastman.

It is possible, of course, that some other company may speed up its preparations and be ready to operate before that time, or that Du Pont may build another plant. However, a long time is required between drawing up plans, breaking ground, and then actually getting on stream. After 1955, polyethylene may be spouting from the pipes of a half dozen or so plants that are now under consideration or even beyond the planning stage, but how they will fare depends upon whether or not polyethylene markets continue to expand at ever-increasing rates.

High military demand: Up to now, the Armed Forces have been walking off with a large slice of all polyethylene produced, and will probably continue to do so indefinitely. When the production rate was from 4 to 6 million lb. a month, the military take was from 33 to 40 percent. After May 1952, when additional capacity came in, military demand dropped to as low as 21% in August. In the fourth quarter, military demand started to increase again so that now, even with a 10 or 11 million lb. monthly production figure, the military demand is back up to 30 to 35% of total production or between 3 and 4 million lb. a month. No one seems able to say whether this demand will increase or decrease in the foreseeable future.

The significant factor in this situation is that wire coating now absorbs only about one third of the military requirements, whereas it it was the major factor until a few months ago. Even the requirements for assault wire and Spiral 4 have kept up almost level with the last quarter of 1952, whereas they were expected to decline. It is believed that there will be a decline at the end of the fiscal year which is June 30, 1953.

Other uses, such as in tow targets, balloons, and ordnance parts have increased in volume, but are comparatively minor insofar as total poundage of polyethylene is concerned. The big and ever-growing usage is in packaging. Shells and rockets, Signal Corps and Ordnance parts, surgical dressings by the million, are now required in a polyethylene film or laminate wrapper. It is hard to conceive of a time in the near future when this inordinate demand for military packaging will cease. It is this circumstance of military demand which helps to explain why polyethylene supply tightened up in a few months' time and confounded the industry when it was thought that the large, new increments which came in during 1952 would satisfy demand for the time being at least.

Civilian demand going up: In the meantime, civilian demand has been increasing at a greater rate than anticipated. Electrical parts, molded applications, pipe, coated paper and film are all on the upsurge, but the demand for the latter seems to be at least the most vocal. When big operators like Celanese and Firestone show unmistakable signs of entering the polyethylene film business in a big way and the older producers give indications that each is struggling to become the volume leader of the field, demand is increased by many fold.

The rush to buy extruders for polyethylene was never more evident than last year. Machinery suppliers estimate that somewhere near one fifth of the 485 extruders sold for plastics last year were intended exclusively for polyethylene and another fourth were intended for part time on polyethylene. In addition, there were an unknown number of extruders converted to polyethylene. There are also a number of extrusion machines in the hands of paper coaters not yet in substantial production, but which were put in place some time before 1952.

Extruders have big stomachs: Small commercial extruders with 2 to 3 in. diameter screws, may use as much as 50 to 60 lb. per hour of polyethylene for tubular film and at top rates might even use as much as 90 or 100 lb. per hour for such things as pipe. The big 4- to 5-in. extruders have reportedly operated as high as 230 to 240 lb. per hour for flat film and might even go to 300 lb. per hour for pipe One company is reported to have laid down as much as 600 lb. an hour on paper from a 4½-in. machine. A comparatively new company, heretofore not even listed in MODERN PLASTICS' directory, is said to have seven or eight extruders working exclusively on polyethylene pipe. Another firm has five machines working almost exclusively on ladies' belts and kindred applications. As noted in another column of this issue of the Plastiscope, one firm is now successfully calendering polyethylene. The battery business now requires thousands of pounds per month of molded polyethylene parts.

Headaches later: But like most any other business, the bigger polyethylene gets, the more headaches it develops. Next month this column will point out some of the pitfalls involved in polyethylene expansion. This material is not going to run all other plastics off the map, and is by no means going to expand indefinitely without leaving some casualties in its wake.

Idea Trailer

DIRECT sales results from the Wilson Plastics, Inc. 43-ft. house trailer, which toured the country in 1952, totaled an average of three installation orders on the spot from each of the 300 showings the Idea Trailer made during its 11 months traveling through 23 eastern and midwestern states.

The trailer is completely finished on the inside with Wilson Lockback Plastic Wall Tile, produced by this Sandusky, Ohio, firm. It features a completely tiled kitchen, a bathroom with recessed tub, lavatory, and three shower stalls, plus panels of Lockback Tile. In addition to this full sales story on Wilson Tile, the Idea Trailer's entire rear wall is devoted to a demonstration of how plastics are molded, showing some 30 plastics objects with explanations of why they are made better in plastics. Since the Idea Trailer appeared principally in smaller towns, this ed-

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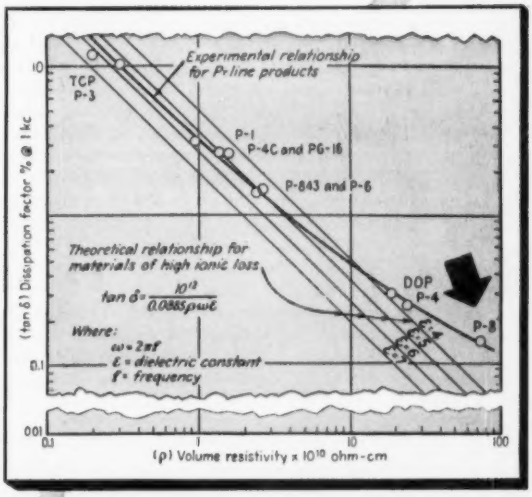

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ucational feature of the exhibit was a salesman for the tile as well. Few of the visitors to the trailer had understood plastics before. Nearly 30% of the visitors admitted they were unaware of the existence of wall tile made from plastics.

Shell Molding Equipment

AN agreement between Shellmold & Machine Co., Inc., 70 Pine St, New York, N. Y., and SPO, Inc., Milwaukee, Wis., will make the manufacturing and distribution facilities of SPO available to Shellmold for the production and distribution of its line of shell molding machinery and auxiliary equipment.

Featured in the Shellmold line and covered in the agreement with SPO are the new hand-and-air-operated Types SU-H and SU-HP shell molding units developed specifically to meet the average foundry's need for a production unit scaled to its operational requirements. Included in the agreement, and therefore also available through SPO's facilities, is the automatic Type SU-1 shell molding machine, a single-station unit already in use in foundries producing stainless valves and a wide variety of other cast-metal parts for the automotive, farm implement, and aircraft industries.

Other equipment to be handled by SPO includes Shellmold's automatic-metering sand-resin-mix recharge feeder, as well as equipment for blending, mold removal, and mold closing.

Resins for Shell Molding

AN industry-wide production of phenolic resins for the shell mold process that will be nearly 17 times the 1952 figure by 1957 is predicted by Robert K. Mueller, general manager of Monsanto Chemical Co.'s Plastics Div. He did not state how much phenolic resin was used for this purpose in 1952, but estimators seem agreed that it was only a few million pounds. Mr. Mueller claimed that his company's production of phenolic resins for the shell mold process represented about 80% of the industry's total in 1952 and that his company expected to produce twice as much in 1953, while the industry as a whole will quadruple its manufacture of resin for shell molding. He also mentioned that two of the largest foundries in the world have adapted their operations to shell molding.

Mr. Mueller said that last year there were 20 foundries in actual production and more than 100 beyond the development stage, but were forced to wait for machines or patterns because the machinery manufacturers were three to six months behind in their deliveries. He stated that most shell molding units are multiple station machines, varying from two to twenty-four, that approximately 300 stations were making shells for castings last year, and that by the end of 1953, the number of stations should be three times those in operation today. He also pointed out that large molded parts are now being produced, contrary to the original belief that they might not be practical. For example, a 300-lb. casting for railroad use has been cast successfully by one foundry.

S. P. E. Officers

THE Ninth Annual Technical Conference of the Society of Plastics Engineers held in Boston, Mass., during January was by far the largest ever held in the history of the Society, with a registration of 954 men and 83 women.

New officers of the Society were announced as follows: president, Walter C. Oelman, vice president and general manager of Standard Molding Corporation, Dayton, Ohio; and vice-president, Stanley Bindman, vice-president of Jamison Plastics Corporation, Freeport, New York. John W. LaBelle, New England district manager of the Koppers Company, Inc., was re-elected as secretary. The new treasurer of the Society is Richard Bruce, regional representative of the Bakelite Corp.

Printing on Vinyl

WHEN a printer attempts to print on plastic film, among the first things he must do is to search for a different type of ink than any he ever used on paper. In making suggestions to help the printer choose his ink, Gordon E. Cook, sales manager of Peerless Printing Ink Co., Ontario & Janney Sts., Philadelphia, Pa., in a recent talk before a group of printers said that an ink for printing on plastic should contain no drier and should set only by evaporation or penetration of the solvent.

The pigment must be stable to sunlight, he said, as well as resistant to the acid which is released as the vinyl sheet deteriorates.

The resin used in the ink, Mr. Cook pointed out, must bind the pigment to the sheet after the solvent has evaporated. The solvent must be capable of dissolving the resin and must have some solvent power for the sheet in order to give the ink a "bite" into the sheet.

He emphasized that the printer should give the inkmaker a sample of the plastic sheet upon which he expects to print because, in general, plastic inks must be custom made to fit each surface.

Gravure printing is the kind best adapted to vinyl inks, continued Mr. Cook, who distinguished between the various kinds of printing as follows:

Surface printing requires a slower drying, heavier bodied ink than other types of printing. Offset printing on vinyl may present problems caused largely by the type of plasticizers used in the sheet. Here it is doubly important that the inkmaker has a sample before the ink is formulated.

Letterpress printing on vinyl demands that all metal surfaces be absolutely grease-free—they should be washed with regular cleaner and then again with acetone or M.E.K. The press must be kept rolling until the job is finished.

Flexographic or aniline printing is handicapped by the action of vinyl solvents on the rubber surfaces, but there are indications that these troubles may be minimized in the near future.

Glass Mat

ANOTHER company has entered the list of several recently announced for the manufacture of glass mat from continuous rovings and made into the conventional weights of the older style glass mat made of chopped strands. The material, called Glastrand, is produced by Strand-

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Strandcote has a completely new facility at 504 S. Prairie Ave., Hawthorne, Calif.

Soil Conditioner Prices

FIVE-pound containers of Krilium soil conditioners have been reduced in price from $6.95 to $4.95, with comparable reductions in other sizes, according to Monsanto Chemical Co., St. Louis, Mo.

The company also announces that it has been issued two new patents pertaining to synthetic organic chemical soil conditioners. One is No. 2,625,529, relating to soil conditioners, and the other, No. 2,625,471, pertains to fertilizing compositions and plant nutrients together with soil conditioners.

Financing Completed

COMPLETION of common stock financing for Lunn Laminates, Inc., Huntington, N. Y., in the amount of $249,000 has recently been announced. The stock was publicly offered at $2 per share and has already enjoyed a substantial market advance.

Control remains in the hands of the founders of the company. The financing was arranged by Eisemann Industrial Corp., 1819 Broadway, New York, N. Y., which specializes in providing permanent capital for the plastics and mechanical industries.

Tetra Carboxy Butane

WHAT is claimed to be a new chemical, tetra carboxy butane, or TCB, a pale yellow to white powder having a melting point of 189 to 192° C., has been put on the market by Jasonols Chemical Corp., 1085-87 Myrtle Ave., Brooklyn, N. Y. Among other applications, TCB can be used with polyhydric alcohols to form resinous products having alkyd characteristics and should yield many novel products because the chemist can tailor and modify the alkyds to suit his every need. It can be used to solve some plasticizer problems and can be copolymerized with adhesive materials to give new properties.

Current prices range from $2.25 for 1 lb. to $1.30 per lb. in 100-lb. lots.

PERSONAL

Robert K. Gibbs, president of **Tri-State Plastic Molding Co., Inc.**, Henderson, Ky., has received an honorary Kentucky colonelcy bestowed upon him by State Senator E. M. Ford of Owensboro.

Julian C. Kazimier has been elected vice president and manager of **Amos Molded Plastics Div., Amos-Thompson Corp.**, Edinburg, Ind. He was formerly director of sales and engineering.

Denton Anderson has been elected vice president of **Plax Corp.**, P. O. Box 1019, Hartford, Conn. He has been assistant vice president and general sales manager since August 1951, and will continue as general sales manager.

M. P. Claytor has been appointed midwestern sales representative for **J. P. Schwebel & Co.**, 424 Madison Ave., New York, N. Y. He was formerly affiliated with **Owens-Corning Fiberglas Corp.** for 12 years.

Jackson Kemper has been elected vice president of **H. K. Porter Co., Inc.**, 1932 Oliver Bldg., Pittsburgh, Pa. He will continue in his present capacity as general manager of **Watson-Stillman Fittings Div.** of the Porter Co. located at Roselle, N. J. All operating and sales activities of this division are under Mr. Kemper's supervision.

George W. Sharpe has been made manager of promotion, merchandising, and sales of **Victory Plastics & Embossing Corp.**, 340 Bond St., Brooklyn, N. Y., with headquarters at 172 Madison Ave., New York, N. Y. Mr. Sharpe was formerly vice president and director of sales at **Prepac, Inc.**

Thomas A. Collins, executive vice president of **Glass Fibers, Inc.**, 1810 Madison Ave., Toledo, Ohio, has been appointed general manager of the company. Before joining Glass Fibers, Mr. Collins served in various managerial capacities at Owens-Illinois Glass Co. for 26 years.

William P. Gage, formerly vice president in charge of manufacturing of **Shell Chemical Corp.**, has been named president of **Grace Chemical Co.**, 7 Hanover Square, New York, N. Y., a subsidiary of **W. R. Grace & Co.**

Glen P. Harris has been appointed technical service engineer for industrial resins of **Monsanto Chemical Co.'s Plastics Div.**, Springfield, Mass. Mr. Harris left the Sales Dept. of Monsanto Chemicals Ltd. to rejoin the Plastics Div., where he was a member of the Research Dept. from 1948 to 1950.

Harry E. Whitmore has joined **Reilly Tar & Chemical Corp.**, 191 Doremus Ave., Newark, N. J., to promote the sale of products from the company's newly formed synthetic organic chemicals department. He is the son of the late Dr. Frank C. Whitmore, Dean of the School of Chemistry and Physics at Pennsylvania State College.

M. Adolph Heikkila, formerly engaged in sales promotion for the paint, plastics, chemicals, building, heating, and air-conditioning fields, has joined the **Technical Literature Dept., Ketchum, MacLeod & Grove, Inc.**, 411 Seventh Ave., Pittsburgh, Pa. He came to the agency from **The New Jersey Zinc Co.**

Fritz Degener is now general sales manager of chemicals for **Heyden Chemical Corp.**, 342 Madison Ave., New York, N. Y. Mr. Degener, associated with the company since 1930, has been assistant sales manager since 1948.

J. Rae Stirrat has been appointed manager of the newly established marketing research and product planning section of **General Electric Co.'s Chemical Div.**, Pittsfield, Mass. He joined the company in 1943 as a

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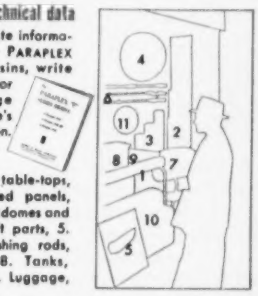

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chemist, and since September 1951, has been in charge of product planning activities.

Jack M. Nims has resigned as vice president and sales manager of **Calresin Corp.** to open his own business as a West Coast wholesale distributor. His new company will be known as **Plastic Materials Supply Co.** with offices and a warehouse in Temple City, Calif. Mr. Nims has been appointed distributor for the western states by **Schwartz Chemical Co.**, 326 W. 70th St., New York, N. Y., producer of dyes, adhesives, lacquers, and enamels for plastics.

Dr. Calvin E. Schildknecht, expert in the field of plastics and synthetic fibers, has joined the faculty of Stevens Institute of Technology, Hoboken, N. J. Dr. Schildknecht will conduct a special graduate course in plastics and will also teach undergraduate courses. He has served the plastics industry in the past on the staff of Du Pont, General Aniline & Film Corp., and Celanese Corp. of America. Dr. Schildknecht is the author of "Vinyl and Related Polymers," which was published in 1952, and "Polymer Processes," which is now in the hands of the printer.

Ralph E. Boerner is now director of industrial relations of **Textileather Corp.**, 607 Madison Ave., Toledo, Ohio. He succeeds **Ralph M. Quin**, who resigned.

John P. Tokarz has completed his assignment with the National Production Authority as assistant chief of the Plastics Branch and has returned to his former position with **Tennessee Eastman Co.** at 448 Shoreham Bldg., 15th & H Sts., N. W., Washington, D. C.

A. A. Dyson, managing director of **Erie Resistor Ltd.**, has been included in Queen Elizabeth's New Years Honors List to receive the Order of British Empire, which is presented to civilians of the British Empire who have performed outstanding service to the Empire. According to **G. Richard Fryling**, president of the parent company, **Erie Resistor Corp.**, Erie, Pa., Mr. Dyson has been active during and since World War II on many British Government electronics planning and production boards and is well known in the United States in the radio and television industry.

John J. Keville, Jr. has been named assistant general sales manager of the **Plastics Div., Celanese Corp. of America**, 180 Madison Ave., New York, N. Y. He will assist **Edward W. Ward**, general sales manager of the division, in formulating and activating sales policies. In addition, he will organize a training program for new members of the sales department, and assume responsibilities associated with sales promotion and advertising. Mr. Keville joined the company in 1936 and has been primarily concerned with the sales of transparent films, molding materials, and sheets. He has also served as director of Product Application and for the past two years was director of Defense Development.

Warren E. Hill has been elected vice president in charge of operations, a new post, by the board of directors of **Emhart Mfg. Co.**, Hartford, Conn. Until recently, Mr. Hill was executive vice president of the Flexible Packaging Div., Shellmar Products Corp., and, prior to that, with Pro-phy-lac-tic Brush Co. for 20 years. Emhart's interest in the plastics field is through its subsidiary, **Plax Corp.**, and its **Standard-Knapp Div.**

George D. Jefferson has been named sales manager of **Corrulux Div., Libbey-Owens-Ford Glass Co.**, with headquarters at the home office in Houston, Texas. He was vice president of Corrulux Corp. before its assimilation by L-O-F, and served as manager of product development of Atlas Powder Co., Wilmington, Del., for ten years. Mr. Jefferson has announced that the five divisional sales offices developed by the former Corrulux Corp. will be retained under the L-O-F setup. They are located in Atlanta, Chicago, Los Angeles, Houston, and Wilmington.

Thomas L. Carver has been named New York sales representative of **Fiber Glass Div., Libbey-Owens-Ford Glass Co.**, 570 Lexington Ave.

Marcus W. Keyes has been appointed to the new position of sales engineer for **Pittsburgh Plate Glass Co.'s Fiber Glass Div.**, 632 Duquesne Way, Pittsburgh, Pa.

COMPANY NOTES

Celanese Corp. of America, 180 Madison Ave., New York, N. Y., announces the following appointments: **John W. Stevens** and **Robert W. Kampschulte** as general sales manager and assistant general sales manager, respectively, of the company's Chemical Div., **A. R. Cockran** as manager of plant operations, Chemical Div., and **William P. Orr**, assistant to Mr. Cockran; and **William C. Goodwine**, sales manager in charge of plasticizers. **K. D. Bowen**, who was formerly manager of plant operations for the Chemical Div., has been promoted to the new position of director of manufacturing coordination for the entire company.

Anchor Plastics Co., Inc., is now located at 36-36 36th St., Long Island City, N. Y.

Hale & Kullgren, Inc., 613 E. Tallmadge Ave., Akron, Ohio, designers of machinery and processes for rubber and plastics, has appointed **Fred Wachter** as sales manager of the company's National Erie Div. and **Paul H. Rossiter**, engineer for the same division. Prior to joining Hale & Kullgren, Mr. Wachter was sales engineer for **National Erie Corp.** for 12 years. Mr. Rossiter, who was in charge of design engineering at National Erie Corp. for 8 years, joined Hale & Kullgren in March 1952.

American Polymer Corp., Peabody, Mass., has named **Cole and DeGraf**, 417 Market St., San Francisco, Calif., as its sales representative. Cole and DeGraf will specialize in the sale of polymer products to paint, rubber, adhesive, printing

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inks, and lacquer manufacturers. They will also handle the sale and promotion of Polymer's soil conditioner, Agrilon.

Witco Chemical Co. has moved to 260 Madison Ave., New York, N. Y.

H & R Industries, 344 E. Walnut St., Nazareth, Pa., have taken over the entire production facilities of the former Mohawk Plastics Corp. H & R claims that the acquisition of this company will increase its injection molding facilities by about 50%.

Boston Woven Hose & Rubber Co., 29 Hampshire St., Boston, Mass., has reorganized its merchandising and advertising personnel and named **H. Stanley Johnson** as director of merchandising and **George A. Taylor** as manager of advertising and sales promotion. At the same time, the company announced the appointment of **Brooke, Smith, French, and Dorrance, Inc.,** New York and Detroit, as advertising and merchandising counsel.

Farrell-Birmingham Co., Inc., Ansonia, Conn., has appointed **Roger E. Vaughan** as assistant general manager of the company's subsidiary, **Consolidated Machine Tool Corp.,** Rochester, N. Y. Mr. Vaughan joined the company in 1936 and has been assistant general manager of the Farrel-Birmingham plant at Buffalo, N. Y., since 1943.

National Plastics Industries, 425 Divisadero St., San Francisco, Calif., acquired the plastic box division of **Fleishhacker Paper Box Co.** last October, but the notice was inadvertently omitted from these columns. National Plastics will manufacture plastic boxes in the Fleishhacker Bldg., 401 Second St., and will continue to fabricate plastics signs, displays, and other commercial items at 425 Divisadero St. The present owners are **Louis E. Hendricks** and **H. M. Schonwald.**

Chemical Development Corp., Endicott St., Danvers, Mass., which manufactures approximately 200 materials for the plastics and allied industries, has established a sales office at 366 Madison Ave., New York, N. Y. **Ross F. Rathbun** will be in charge of all sales in the New York City area and northern New Jersey.

Delaware Research & Development Corp. has moved to 222 Sunset Drive, Delaire, Wilmington, Del.

Gustin Bacon Mfg. Co. has established a Kansas City Sales Div. in the Centennial Bldg. and has named **George R. McMullen** as manager. **W. M. Doughman** and **Grant I. Wyrick** have been assigned to the division as sales and service engineers. The new division will cover a four-state area and will concentrate on sales of the company's fibrous glass insulation and industrial products.

Sterling Products Co., fabricators of plastic furniture covers, is now located at 236 E. Ninth St., St. Paul, Minn. Expanding sales during the past year necessitated the move to larger quarters, which consist of 12,000 sq. ft. of factory space, all on one floor.

The company has appointed **Murray Weinstein** and **Al Sheman** as its New York representatives with offices at 254 Fifth Ave. Sterling is represented on the West Coast by **Clay Estes** at the Western Merchandise Mart.

American Polymer Corp., 101 Foster St., Peabody, Mass., announces the appointment of **Miss L. J. Baxter** as director of Customer Service Div., a special department designed to expedite deliveries of orders, coordinate shipments, and facilitate requests for special products that are in pilot plant or experimental production stages.

Monsanto Chemical Co. has appointed **Donald J. Miller** as manager of its new plant at Avon, Calif. **Frank S. Bonham** succeeds Mr. Miller at the Long Beach, Calif., plant. The new plant at Avon will manufacture phenol and other heavy chemicals. The Long Beach unit produces styrene and Krilium soil conditioner.

Monsanto Chemical Co.'s Plastics Div., Springfield, Mass., has announced a newly created section of the Sales Dept., to be headed by **Edmond S. Bauer, Jr.,** to handle industrial resins. **David L. Dondy,** of the Chicago office, has been promoted to assistant sales manager of industrial resins under Mr. Bauer.

Calresin Corp., Arcadia, Calif., and Ottumwa, Iowa, announces the appointment of **Douglas Wilkings** as production manager of the Arcadia plant and **C. E. Hampton** and **Fred Woodward** as technical sales engineers.

Flambeau Plastics Corp., Baraboo, Wis., manufacturers of the Flambo-Ware line of plastics housewares, has purchased the complete housewares line, including all manufacture and sales rights, from **Lincoln Plastics Corp.,** Cambridge, Ohio. Lincoln's accounts will be serviced by Flambeau.

Cadet Chemical Corporation has moved to 717 Elk St., Buffalo, N. Y.

Michigan Chrome & Chemical Co., 6340 E. Jefferson Ave., Detroit, Mich., announces the appointment of **King Ruhly** as sales manager of the Chemical Div. and **Frank Jones** as assistant sales manager. Mr. Ruhly succeeds **George H. Russ,** who has retired.

Godfrey L. Cabot, Inc., 77 Franklin St., Boston, Mass., has announced that the personnel of **Delacour-Gorrie Ltd.** has joined its Canadian company, **Cabot Carbon of Canada, Ltd.** The Canadian organization will produce oil furnace blacks and will act as sales representative for Cabot carbon blacks and plasticizers.

Imperial Chemical Industries Ltd., London, England, and **The Visking Corp.,** Chicago, Ill., are proposing to form a joint company in Great Britain to manufacture polyethylene film.

Thomas Mfg. Corp., designers and manufacturers of plastics toys, announces the opening of new show rooms in the "toy center of the world," 200 Fifth Ave., New York, N. Y.

Franklin-Parker, Inc., 640 Franklin Ave., Hartford, Conn., has been formed as an industrial design company which will offer complete design service to any molder, fabricator, and user of plastics products.

American Extruded Products Co., 1023 N. La Brea Ave., Los Angeles, Calif., has been awarded a patent

for decorating plastics

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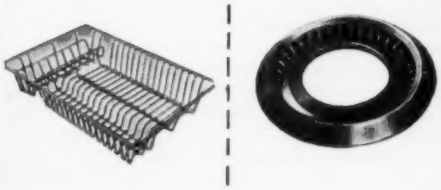
70 West Liberty Street Waterbury, Connecticut

VINYL PLASTISOLS



MICCROSOL, a product of Michigan Chrome & Chemical Company, is a true vinyl plastisol which can be readily adapted, through special formulation, to meet the strictest requirements for: dipping, casting, slush molding, etc.

We will be pleased to submit a sample of one of our many proven coatings, or engineer a vinyl plastisol for your product.

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THE PLASTISCOPE

with 14 claims on its method and machinery for manufacturing a new type of plastics garden hose.

Ideal Toy Corp., 200 Fifth Ave., New York, N. Y., announces the following promotions in its sales dept.: **Abe Kent**, former eastern sales manager, has been made sales manager. Associated with Ideal since 1935, Mr. Kent will coordinate sales efforts with special emphasis on the eastern seaboard. **William Pierce** is southern sales manager; **Richard Klein**, assistant sales manager; and **Melvin N. Poretz**, sales promotion manager. The company's 1952 sales totaled nearly $23 million.

Harte & Co., Inc., 267 Fifth Ave., New York, N. Y. has broken ground for a new plant to augment production facilities for the manufacture, printing, and embossing of Wataseal vinyl film. The structure, which will be located at Ash, Box, and Oakland Sts., Brooklyn, N. Y., will also provide production facilities for the manufacture of polyethylene film and tubing under the Plicose trademark.

Hardesty Chemical Co., Inc. has merged with **W. C. Hardesty Co., Inc.** and will operate as **Hardesty Chemical Div. of W. C. Hardesty Co., Inc.** from its present headquarters, 41 E. 42nd St., New York, N. Y. **Howard M. Abbott**, vice president of Hardesty Chemical is also vice president of the Hardesty Co. Other personnel will continue in their present capacities.

Carlisle Corp.'s Mobile Plastics Div., Mobile, Ala., manufacturer of plastics coated fabrics and reinforced laminates, has named **Jack D. McCown** as its sales manager.

Rohm & Haas Co.'s Plastics Dept. announces that **Richard F. Berentsen** has been transferred to its New England territory. **Walter C. Haller** replaces Mr. Berentsen and will handle the metropolitan New York area for the company, with headquarters at 350 Fifth Ave., New York, N. Y.

American Lucoflex, Inc., 1 E. 57th St., New York, N. Y., has appointed **Colorvision Plastics, Inc.**, 247 Atlantic Ave., Boston, Mass., as a licensed fabricator of Lucoflex, the unplasticized hard polyvinyl chloride material. The appointment is part of the expansion of the chain of Lucoflex fabricator-licensees throughout the United States and Canada.

Harmon Color Works, Kearny, N. J., a division of **The B. F. Goodrich Co.**, has become a part of **B. F. Goodrich Chemical Co.**, Cleveland, Ohio. **Orville E. Isenburg**, formerly international sales manager for B. F. Goodrich Chemical, has been named sales manager of Harmon Color Works.

Fabricon Products, Inc., Plastics Div., 1721 W. Pleasant Ave., River Rouge 18, Mich., announces the appointment of **D. W. McArthur** to its sales staff. His headquarters will be in Los Angeles, where he will be in charge of the company's west coast sales of its complete line of resin impregnated and coated materials.

Continental Can Co.'s Conolite (laminated plastics) operations, formerly a part of the **Plastics Div.** in Cambridge, Ohio, have been taken over by **Bond Crown & Cork Co.**, a wholly-owned subsidiary, and transferred to 4300 N. Port Washington Rd., Milwaukee, Wis.

Dewey & Almy Chemical Co., Cambridge, Mass., is producing dibutyl maleate for sale at 30¢ per lb. in tank car quantities. It is recommended specifically for use with vinyl chloride.

The M. W. Kellogg Co., P. O. Box 469, Jersey City, N. J., a subsidiary of Pullman, Inc., has established new warehousing facilities on the West Coast for Kel-F molding powders. They are located in California, Oregon, Washington, Arizona, Nevada, and Utah.

Olin Industries, Inc., New Haven, Conn., announces the formation of a general research organization and has appointed five department managers. Among the five appointees are **Dr. Herman Bruson** and **Hibben Ziesing.** Dr. Bruson, named head of organic chemical research, is one of the country's top polymer chemists and holder of 280 United States patents covering the fields of plastics, resins, coating materials, etc. He came to Olin from **Industrial Rayon Corp.** where he was manager of its Polymer Laboratory. Previously, he was research chemist at Rohm & Haas Co. and Goodyear Tire & Rubber Co. Mr. Ziesing, formerly Far East manager of **American Cyanamid Co.** and chief of the Organic and Heavy Chemical Div. of OPS during World War II, is head of Petrochemical Research.

Atlantic Chemical Co., Inc., Centredale, R. I., has purchased the controlling interest of **Metro Dyestuff Corp.**, Quidnick, R. I., and has changed the company name to **Metro-Atlantic, Inc.** Southern headquarters for the combined companies have been established at 1210 New Buncombe Rd., Greenville, S. C. The company merchandises dyestuffs and pigments used in the plastics industry.

Eastman Chemical Products, Inc., Kingsport, Tenn., a new division of **Eastman Kodak Co.**, will hereafter handle the marketing of the chemical products manufactured by **Tennessee Eastman** and **Texas Eastman. J. C. Stone**, formerly executive vice president of Tennessee Eastman, is president of the new organization. Among other appointments are **S. E. Palmer**, vice president, and **D. C. Williams**, sales manager for plastics; **H. L. Ford**, vice president, and **J. E. Magoffin**, sales manager for chemicals.

Offices of Eastman Chemical Products, Inc. are planned for Kingsport, Tenn.; New York, N. Y.; Lodi, N. J.; Providence, R. I.; Framingham and Leominster, Mass.; Rochester, N. Y.; Cleveland and Dayton, Ohio; Detroit, Mich.; Chicago, Ill.; St. Louis, Mo.; Houston, Texas; Greenville and Greensboro, N. C. **The Wilson & Geo. Meyer & Co.** and **Wilson Meyer Co.** will continue as sales representatives on the West Coast with offices in Los Angeles, San Francisco, Portland, and Seattle.

Spill Mfg. Co., 104 Cornelia St., East Rutherford, N. J., manufacturer of sunglasses, has been sold to a group of New Jersey businessmen headed by **Dominic Marconi** of the law firm of **Marconi & Leder.** According to Mr. Marconi, who becomes president of the sunglass com-

Faster production...lower costs for "measured in pounds" injection moldings

New booklet for injection molders tells how best to meet demand for large-sized moldings

How to get maximum results with a minimum of time and material loss is the big problem facing injection molders today, as the trend to larger and more complex moldings continues.

As solutions to this problem, concentrated attention has been given to new molding machines . . . new mold construction techniques . . . refinements and improvements in the molding process , . . and new, improved materials.

For your guidance, Monsanto has gathered into *one* booklet the most recent information on all of these subjects... plus a listing of the molding problems most frequently encountered and their chief causes.

You'll find the answers to many of your questions and problems on large-sized moldings here. Send for your *free* copy of Monsanto's booklet, "Injection Molding Lustrex Styrene Plastic," today. The coupon is for your convenience.

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Please send me your booklet, "Injection Molding Lustrex Styrene Plastic."

Name & Title _____

Company _____

Address _____

City, Zone, State _____

THE PLASTISCOPE

pany, the new owners include **N. T. Baldanza**, formerly chief engineer of **Columbia Protektosite Co.**, who will serve as vice president; **Joseph Mazza**, formerly president of **Plastic Art Toy Corp. of America**, who has been named secretary-treasurer; and **Edmond J. d'Angio**, recently assistant sales manager of Columbia Protektosite, who has been appointed sales and advertising manager.

Semet-Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y., is now producing on a small plant scale at Buffalo, N. Y., a new material derived from ethylene, called Alcowax. A full-scale petrochemical plant is under construction at the same location for the production of this material and will be in operation some time in 1953. Suggested uses for this material would be in coatings for paper, lining metal containers, polishes, textiles, candles, electrical insulation, and also as an ingredient in printing ink, varnish, paint, leather finishing compounds, latex dispersions, strip coatings, cosmetics, and many other operations.

Sales and inquiries will be handled by **Petrochemical Sales**, 40 Rector St., New York, N. Y.

EXPANSION

United Plastics Industries, Inc., 1300 Water St., Vassar, Mich., has under construction a new warehouse and is enlarging its engineering department and tool room. New molding machines will also be added to the company's present battery of injection machines. Plans for completion of the expansion program are scheduled for June 1953. United Plastics was founded in 1945. In addition to molding parts for the automotive, refrigeration, radio, and industrial manufacturing concerns in the midwest area, it has placed special emphasis on nylon molding. **Lawrence S. Brown** is president and general manager of the firm.

Allied Chemical & Dye Corp.'s Nitrogen Div. has announced plans for urea products expansion at its South Point, Ohio, plant. The project, involving an expenditure of over $4 million, includes doubling of the plant's urea synthesis capacity, together with installation of facilities to produce a pebbled urea fertilizer compound and an improved urea cattle feed compound. Completion of the plant will be in early 1954.

E. L. Cournand & Co. announces that it is moving its low pressure molding facilities to Havre de Grace, Md. The new setup will be located on 15 acres of land and will consist of four buildings—two 25,000-sq. ft. plants; a 10,000-sq. ft. office building; and a 10,000-sq. ft. warehouse.

Dow Chemical Co. has started construction on a plant at Torrance, Calif., for the manufacture of Styron. Scheduled for completion in the fall of 1953, the plant will be part of a three-phase program for increasing Styron production facilities. An addition to the plastics building at Dow's headquarters in Midland, Mich., is now in operation, and a newly completed plant on the Thames River at Allyn's Point, Conn., went into full production last October. The Torrance plant, being built on a 53-acre tract, will have about 72,000 sq. ft. of floor space, including a four-story production building, a warehouse, and offices.

Taylor Fibre Co.'s Norristown, Pa., plant is now nearing completion. The project will increase by over 20% the total floor space available in the plant and will be used to increase the production of vulcanized fibre. The company reports that this is one step in the $1½ million Taylor expansion plant, established as a result of the Defense Production Administration Vulcanized Fiber goal, announced early in 1952. The goal is designed to increase the national vulcanized fiber output from 50 to 60 million lb. annually.

Reed-Prentice Corp., Worcester, Mass., recently completed a factory building which provides 23,000 additional sq. feet.

Plax Corp., West Hartford, Conn., has started construction of its new plant in the Shively section of Louisville, Ky. The manufacture of polyethylene sheet and layflat tubing, plastic bottles, and Polyflex sheet is scheduled for the new plant.

Heyden Chemical Corp. and **Monsanto Chemical Co.** have entered into an agreement to build a methanol plant adjoining Monsanto's new acetylene facilities in Texas City, Texas. Heyden and Monsanto will share equally in the cost of construction and in the output of the plant, which will have approximately 25 million gal. per year capacity. Commercial production will begin in January 1955.

Methanol is one of the raw materials required by Heyden in the production of formaldehyde, hexamethylenetetramine, and pentaerythritol, the base for quick drying weather-resistant paints, varnishes, resins, and lacquers.

MEETINGS

March 8-11—American Institute of Chemical Engineers, Buena Vista Hotel, Biloxi, Miss.

March 10-11—Society of the Plastics Industry of Canada, Eleventh Annual Conference, General Brock Hotel, Niagara Falls, Canada.

March 16-20—National Association of Corrosion Engineers, Inc., Ninth Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill.

April 8-10—Society of the Plastics Industry, Pacific Coast Section Conference, Last Frontier Hotel, Las Vegas, Nevada.

April 21—Association of Consulting Chemists & Chemical Engineers, Inc., Symposium, Hotel Belmont Plaza, New York, N. Y.

April 26-29—American Institute of Chemical Engineers, Royal York Hotel, Toronto, Ontario.

May 9-15—Society of the Plastics Industry, Annual Meeting and Conference, Cruise to Bermuda.

S. P. E. Meetings

March 18—New York Section Technical Meeting, Gotham Hotel, New York, N. Y.

April 15—New York Section Technical Meeting, Gotham Hotel, New York, N. Y.

May 20—New York Section Technical Meeting, Gotham Hotel, New York, N. Y.

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Gold plated, copper, antique and pastel effects are achieved by a simple dip and rinse of the previously plated object.

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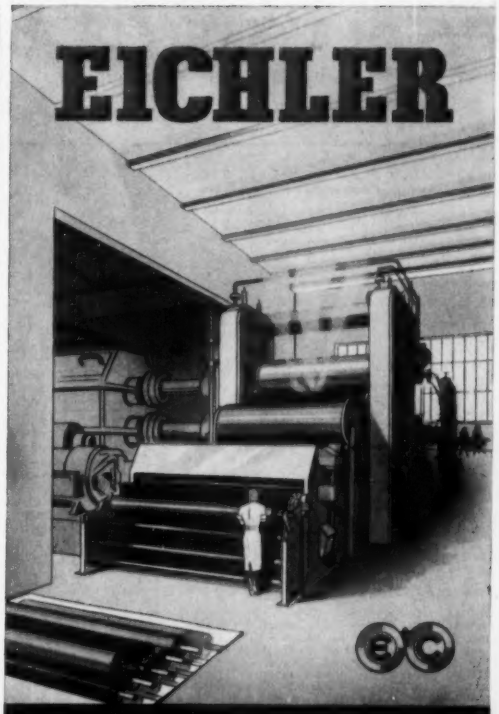

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MACHINERY and EQUIPMENT FOR SALE

FOR SALE: Quick delivery Rubber and Plastic Equipment. Farrel 16"x48", and 15"x36", 2 roll rubber mills. Other sizes up to 84". New Seco 6"x12" and 6"x16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. HPM 200 ton Hydr. Press 4 opening, 32"x50" platens. 200 ton Brunswick 21"x21" Platens, 14" Ram. Record Presses. Wat.-Still. 100 ton 24"x24". Elms 75 ton 30"x36". Also presses Lab. to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 3 stage Centrif. Pump 250@ W.P. W.S. 4 Plgr. High and Low Pressure Hydr. Pump. HPM 5 GPM 2700 lbs. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machines ½" to 3". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers 100, 50, and 9 gal. Plastic Grinders. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street, Brooklyn, 15, N. Y., STerling 8-1944.

FOR SALE: Reinforced Plastics Press 54" x144". Injection Presses: 16 oz. Reed, 4 & 9 oz. HPM, 16 oz. Lester. 22 oz. Impco VF822. 1 oz. Van Dorn. Extruders: 3½" NRM, Royle No. 1 Wire cov. setup, oil heated. NRM 2½" screw. NRM Wire reel. Scrap grinders. Ovens. Honan Oil filter No. 24. Transfer & Compression Presses. 1—500 ton Compr. Press 48" x 48" Pl. 3, 12 & 50 ton Lab presses. Preform presses: Colton 5½ T. Kux 25. 1—16" x 36" Rubber mill. Sherid. Embosspress No. 9. 42" Slitting & Rewind. machine. 7½ HP Varidrive. 3 HP Gas boilers. List your surplus equipment with me for prompt action. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: 1—Farrell 20" x 48" Plastic Mill, m.d.; 1—Farrell-Birmingham self-contained 6" x 13" 3-roll vertical Calender, m.d.; 1—Royle 2" oil heated Plastics Extruder; 1—Baldwin 200 ton Molding Press; 1—Colton #5½ Preform Press. Also Grinders, Extruders, Compression and Injection Molding Presses, Mixers, etc. Send us your inquiries. We buy your Idle Equipment. CONSOLIDATED PRODUCTS CO., 13-14 Park Row, New York 38, N. Y. BArclay 7-0600.

ONE 350 TON HYDRAULIC PRESS, 36"x25" platen area, 19" dia. ram, 12" stroke, 12½" daylight, 4—4½" columns. Complete hydraulic systems with low and high pressure pumps, motors, solenoids and relief valves. Operated only 6 months. Excellent condition. $3750.00 where is and as is. MARCO PRODUCTS, INC., Clifton Heights, Penna.

FOR SALE: Two (2) Watson-Stillman Angle Presses, 75-Ton Vertical Ram and 225-Ton Horizontal Ram, with 8-GPM Superdraulic Pump and Greer Hydraulic Accumulator. Attractive Price. Reply Box 334, Modern Plastics.

INJECTION MOLDING Lester 8 oz. Plastic Inject. Molding Machine. 400 ton cap. closing. 1500 ton holding. 21"x25" Platen. 350 shots per hour. 80¢ per hour. PRODUCTION AND EQUIPMENT CO., 1534 Trumbull Ave. Detroit 16, Mich.

FOR SALE: 1—4 oz. Watson Stillman Injection Molding Machine complete with instruments, good condition. Can be seen in operation. BACHMANN BROS., INC., 1400-1438 East Erie Ave., Philadelphia 24, Pa.

FOR SALE—A Number of 4 oz. Injection Molding Machines. Reply Box 323, Modern Plastics.

SAVE WITH GUARANTEED REBUILT EQUIPMENT—RUBBER MIXING MILL, heavy duty 18"x48"; HYDRAULIC PRESSES: 28" x 28", 750 ton, 18" ram. HOBBING, 26"x18", 12" main ram, TRANSFER, 170 tons; 20"x20", 10" ram 118 tons, 24"x20", 10" ram, 118 tons; 20"x20", 10" ram, 200 tons, 30"x20", 8" ram, 75 tons, 18"x18", 8" ram, 75 tons, 19"x24", 10" ram, 75 tons, 12"x12", 6½" ram, 50 tons, 14"x14", 8" ram, 50 tons, 8"x9½", 4½" ram, 20 tons, 16"x16", 3½" ram, 12 tons; LABORATORY PRESSES: Carver, model 150, 10 ton, Buehler 10"x7" 12 ton; NEW UNIVERSAL DUAL PUMPING UNITS: 3 to 15 HP; NEW LABORATORY MILLS & CALENDERS; EXTRUDERS: Royle 2½ Plastic, insulating type, NRM, 6", strainer type; ACCUMULATOR, HPM 8" ram, 2500#, PREFORM PRESSES all sizes, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO., INC., 285 Hudson St., New York 13, N.Y.

1½" M.P.M. HORIZONTAL PLASTICS EXTRUDER; complete with tapered depth stock screw, wire covering crosshead, filament crosshead, Partlow temp. controls, and Sterling 3 H.P. variable speed drive. In very good condition with less than 750 hr. of operation. TWO STAGE M.P.M. filament drawing and annealing machine with 2 H.P.-US Vari-drive motor. Two pairs of drawing godets each independently variable with respect to the third pair. Condition as above. ZO SPINDLE M.P.M. TURBINE DRIVEN spooling unit with ½ H.P. Graham driven waste roll and hydraulic guide traverse. Complete with 3 H.P.-G.E. motor, oil pump and reservoir. Condition as above. BATES MANUFACTURING CO. LABORATORY, P.O. Box 591, Lewiston, Maine.

FOR SALE: 20 Ton WS 18" x 18" Platen, 50 Ton PRESS 20" x 20" Pl., 75 Ton ADAMSON PRESS 20" x 20" Pl., 75 Ton WS 15" x 15" Pl., 140 Ton WS 23" x 17" Pl., 150 Ton HPM Triple Action 36" x 36" Pl. 175 Ton HPM 30" x 30", 250 Ton WS 28" x 24", 300 Ton WS 20" x 20", 300 Ton WS 24" x 29" Platen. 8-oz. WS, 9-oz. HPM, 4 oz. DeMattia Injection Molding Machines. Accumulators, Laboratory Presses, Pistons & Oil Pumps, Pulverizers, Scrap Cutters, Grinders, Ball & Jewell, Cumberland. AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N. Y. WOrth 4-8233.

FOR SALE: L-3-10 16-ounce Lester injection molding machine, complete with instruments, controls, and heart type cylinder. Spare cylinder and timers. Machine in good condition. Make offer. Leominster 5-C-8-ounce injection molding machine, complete with controls. Good condition; $6300. Machine can be inspected in operation. MONROE PLASTICS COMPANY, 100 Bickford St., Rochester, N. Y.

FOR SALE: 1—Ball & Jewell No. 1½ Rotary Cutter, stainless steel. 4—Mikro Pulverizers #1-SH, #1-SI, #2-SI, #2-TH. 2—Kux Rotary Pellet Presses. 4—Stokes D-3 Rotary Pellet Presses. Read 600 lb. Jacketed Ribbon Mixer. Large stock Stainless Steel Tanks and Kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

INJECTION MOLDING MACHINES
22 oz. Impco
9 oz. HPM
6 oz. Reed-Prentice
4 oz. HPM
Reply Box 329, MODERN PLASTICS

USED PLASTIC MACHINERY—List of current offerings on request. Send us your inquiries. Advise us what you may have for sale. PLASTIC MACHINERY EXCHANGE, 426 Essex Avenue, Boonton, N. J., U.S.A., Cable Address—PLASMEX.

FOR SALE: 8 ounce Lester injection machine. Model L-2½-8 with solid frame. Good condition and can be seen in operation. Reply Box 330, Modern Plastics.

PLASTIC MACHINERY—Hydraulic presses, Extruders, Mills. M. F. MADIER, 64 Fulton St., New York.

FOR SALE AT TREMENDOUS SAVINGS: Colton 2 and 3 RP Rotary Tablet Machines. Mikro 2SH, 3TH, 4TH Pulverizers; Jay Bee and Schutz O'Neill Mills. Baker Perkins & Readco Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers. Baker Perkins 150 gal. D.A. Unidor Jacketed Mixer. Baker Perkins 100 gal. D. A. Vacuum Mixers. J. H. Day from 8 up to 75 gal. Imperial and Cincinnatus D. A. Jacketed Sigma Blade Mixers. Day & Robinson 100 up to 4000 lbs. Dry Powder Mixers. Pony ML and M Labelrites. Package Machy. FA, FA4, Miller, Haysuen 3-7, Scandia auto. Wrappers. Hudson Sharp Campbell auto cellophane Wrapper. REBUILT AND GUARANTEED. This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO., 318-322 Lafayette St., New York 12, N. Y.

PARTIAL LIST of available machines, may be inspected in operation: 2—20 ounce Lesters, 1949 & 1952. 3 ounce Hy-Mac horizontal self contained. 4 ounce H.P.M., new 1944. 6 ounce Lester, 1935, $3500. 7 ounce H.P.M., 1940, $6500. 6 ounce Watson-Stillman, $5500. 6½ ounce Grotelite, $4500. 8 ounce DeMattia, 1946, $8500. 8 ounce Leominster, 1946, $7500. 8 ounce Watson-Stillman, 1944, $7000. 12 ounce Lester, w/extra cyl., $10,000. 12 ounce Watson-Stillman, 1948. 60 ounce Jackson & Church, new 1950. 2,000 Ton Hydraulic press. ACME MACHINERY & MANUFACTURING CO., P.O. Box 731, 102 Grove St., Worcester, Mass. Tel. WOR 7-1527.

WE HANDLE HYDRAULIC PRESSES, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. HYDRAULIC SAL-PRESS, INC., 286-90 Warren Street, Brooklyn 2, N. Y. MAin 4-7847.

MACHINERY and EQUIPMENT WANTED

WANTED: Plastics and Rubber Processing Machinery including Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set up plant now operating or shut down. When offering give full particulars. P.O. Box 1351, Church Street Sta., New York 8 N. Y.

INJECTION MOLDING MACHINES—16 to 24 ounce used injection molding machines required for export. Must be in good condition and available for inspection under operating conditions. DAVID ROME ASSOCIATES, 350 Fifth Avenue, New York 1, New York, CHickering 4-4170.

WANTED: NEW OR USED 2½" or 3½" N.R.M. extruders. Also parts such as cylinders, etc. ANCHOR PLASTICS CO., Telephone: RAvenwood 9-1494, Extension 1, Long Island City, N. Y.

WANTED—GOOD USED 15 ton Stokes Automatic Molding Presses. Please state age, condition, and price of the machine being offered. Address replies to RODALE MFG. CO., INC., 6th & Minor Sts., Emmaus, Pa.

(*Continued on page 204*)

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Maintains Full Widthwise Stretch on all paper, rubber or plastic sheeting and films.

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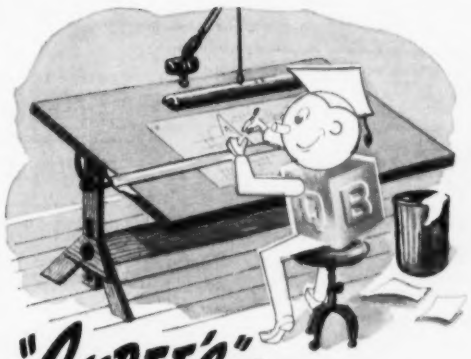

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Quinn-Berry Corp. PLASTICS

CLASSIFIED ADVERTISING

(*Continued from page 202*)

WANTED—4 or 6 oz. injection machine. Must be in perfect operating condition. State make, year and price. PLASTIC PRODUCTS, INC., 415 Lexington Ave., New York 17, N. Y.

WANTED: 4 oz. late model HPM injection molding machine. Give serial number and full information. HEYMAN MANUFACTURING COMPANY, Kenilworth, New Jersey.

WANTED
8 or 12 oz. Reed Prentice Molding Machine. Late Model, Good condition.
Reply Box 340 Modern Plastics

WANTED: Plastic injection moulding machines. Get our offer before you sell. ACME MACHINERY & MFG CO., 102 Grove St., Worcester, Mass.

WANTED: One 2 oz. and one 4 oz. injection molding machine. Principals preferred. Reply Box 341, Modern Plastics.

WANTED—Reed Prentice or Watson-Stillman Injection Molding Machines, 8 oz. to 24 oz. PREMIER PLASTICS, 905 Atlantic Ave., Brooklyn 38, N. Y.

EQUIPMENT WANTED: Used extruder for pelletizing liquid polyethylene. Reply Box 325, Modern Plastics.

MATERIALS FOR SALE

ATTENTION MAT USERS! FOR SALE: 2-oz. Fiberglas Mat in 175' New Rolls 1½-oz. Fiberglas Mat in 200' New Rolls in widths from 9" to 29" with #16 Finish. One edge Factory finish, other edge clean cut. Price 45c per pound F.O.B. Miami. Reply Box 398, Modern Plastics.

MATERIALS WANTED

WANTED: PLASTIC SCRAP OR REJECTS in any form. Also surplus and obsolete lots of virgin molding powders. We also custom reprocess your own scrap. A. BAMBERGER CORP., 703 Bedford Ave., Brooklyn 6, N. Y. Telephone: MAin 5-7450.

WANTED: Materials needed by INJECTION MOLDER (PRINCIPAL). Can use any quantity, any colors, Acetate or Butyrate, virgin or scrap. Reply Box 318, Modern Plastics.

WANTED: LUCITE & PLEXIGLAS—Surplus sheet stock, cut-offs, salvage and scrap. We deal only in acrylic sheets, rods and tubes and offer specialized attention to your inquiries. DUKE PLASTICS CORP., 406 Atlantic Ave., Brooklyn, N. Y. ULster 8-9413.

WANTED: THERMOPLASTIC SCRAP of any description. Excellent prices paid for your vinyl, acetate, butyrate, polystyrene, polyethylene, acrylic and nylon scrap or rejects in any form shape or color. Shipping to us is no more trouble than shipping to any U.S. point. For best prices for your plastic scrap contact: KAYSON RUBBER & PLASTICS LIMITED, Galt, Ontario, Canada.

WANTED: Plastic scrap such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. We also buy surplus inventories of molding powder or grind, clean and reprocess your own scrap. CLAUDE P. BAMBERGER, INC., 152 Centre St., Brooklyn 31, N. Y., Tel. Main 5-5553. Not connected with with any other firm of similar name.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 1671 McDonald Avenue, Brooklyn, N. Y., ES 5-7943.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic, Ethyl Cellulose. Reply Box 315, Modern Plastics.

MOLDS FOR SALE

FOR SALE: 1—Ten cavity mold producing rolling pin handles, and 1—ten cavity mold producing rolling pin handle stud. Handles also suitable for children's jump ropes. Molds in excellent condition. Priced for quick sale. Reply Box 344, Modern Plastics.

MOLDS WANTED

BRUSH MOLDS AND BRUSH MACHINERY —Injection molds for ladies', men's, military, nail, tooth brushes, etc. Send particulars and samples. Reply Box 759, Realservice, 110 W. 34 St., New York, N. Y.

MOLDS WANTED for injection molding for export. Plates, bowls, trays and other household items. Reply Box 336, Modern Plastics.

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resaleable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to VICTORY MANUFACTURING COMPANY, 1722 W. Arcade Place, Chicago 12, Illinois.

HELP WANTED

AN EXPANDING medium-sized firm located in Connecticut since 1832 has an opening with excellent opportunities in their Sales Department for a qualified man to cover Western Pennsylvania, Central and Southern Ohio, parts of Kentucky, West Virginia and Indiana. Desirable to have an engineering degree or engineering background, preferably with sales experience, but not necessary. Should be between 25 and 35 years of age. Guaranteed earnings plus expenses the first year; straight commission plus expenses thereafter. This organization is a creator and fabricator of unique fibrous and plastic materials. Interested men are invited to write for further particulars and submit a resume of their experiences and training, a recent photograph and salary expected. Reply Box 311, Modern Plastics.

CHEMIST, thoroughly experienced in treating with melamine and phenolic resins for high pressure laminates. Excellent position with expanding Eastern company. Send full resume. All replies treated in strict confidence. Reply Box 319, Modern Plastics.

CHEMIST — WELL EXPERIENCED IN VINYL FILM AND SHEETING — EXCELLENT OPPORTUNITY. REPLY BOX 345, MODERN PLASTICS.

CHIEF CHEMIST—Experience in 12 to 20 gauge vinyl calendering sheeting. Administrative and executive ability. Excellent opportunity for right man. Send complete resume education and experience. Reply Box 314, Modern Plastics.

CUSTOM MOLDING REPRESENTATIVE: Rapidly expanding Midwest Custom Injection Molding Company requires representation in all midwest industrial areas on commission basis. Have excellent assembly facilities which include all types of finishing, painting and decorative work. Reply Box 304, Modern Plastics.

DEVELOPMENT ENGINEER: Ch.E. or M.E., background in fiberglas reinforced polyesters desirable but not necessary. Submit complete resume, along with recent snapshot and salary requirements. Reply Box 329, Modern Plastics.

DEVELOPMENT ENGINEER for plastic toys. Must be experienced in mechanics, die layout and injection molding techniques. Plant located in Los Angeles. Salary commensurate with experience and ability. Reply Box 302, Modern Plastics.

PLASTICS ENGINEER—Diversification of extruded thermoplastic products line by well-established company located New Jersey metropolitan area creates excellent opportunity for man having some experience with rigid vinyls. Primary responsibility will be research and development. Please submit complete resume for prompt and confidential consideration. Reply Box 333, Modern Plastics.

PLASTIC ENGINEER

Excellent opportunity for man with degree in chemical, mechanical, aeronautical or industrial engineering and five years or more of industrial experience.

Experience must be with low pressure moulded laminates utilizing fiberglas and polyester resins. Must know laminating techniques and be familiar with various types of construction such as honeycomb sandwich, foam and preform.

Principal duties will be in design, development and application. Will also work closely with estimating, tooling and production departments and may make customer contacts.

This is a permanent position with an old established firm. It will pay a good starting salary to the right man and offer an excellent opportunity to grow with a new division which has been formed by our expansion into a new field. We can offer good living and working conditions and exceptional employee benefits.

If you are interested in this challenging opportunity, write details of your training and experience to:

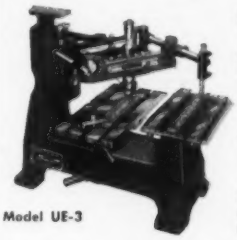
Personnel Manager
The Brunswick-Balke-Collender Co.
Marion, Virginia

PLASTIC TECHNICIAN—Experienced in vacuum molding of thermoplastics. To develop items, make sample dies, supervise production. Excellent opportunity. Located Suburb N.Y.C. Please send resume of experience and training. Reply Box 337, Modern Plastics.

PLASTICS ENGINEER—Old established Chicago company with national leadership needs top engineer experienced in all phases of compression molding. Must be familiar with materials, mold design, production and technical sales. Write fully giving education, experience and record of past performance. Reply Box 310, Modern Plastics.

PLASTICS ENGINEER. Old line company, with established distribution, to open new Plastics Department and want experienced man to take complete charge of manufacturing. Must be familiar with compression molding, Melamine, etc. Products to be made are Trays, Dinnerware, Salad Bowls, Ice Buckets, Pitchers, etc. Our man must know best material for each item, machinery required, how to figure cost on finished products and other matters pertinent to manufacture of the above items. Plant is located in the middlewest section. Please state experience, salary expected, age, and educational background in your letter. We feel this is a wonderful opportunity for some one not afraid of responsibility and willing to grow with our company and the industry. Reply Box 307, Modern Plastics.

(*Continued on page 206*)



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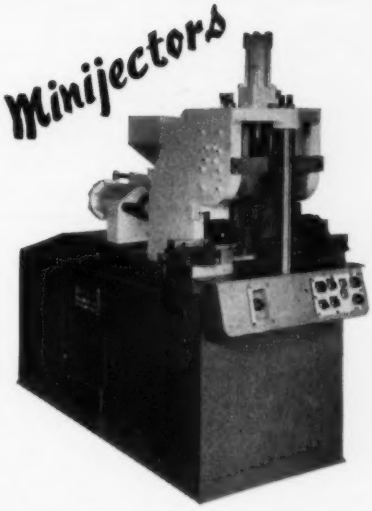

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CLASSIFIED ADVERTISING

(Continued from page 204)

PLANT SUPERINTENDENT: We have an opening for an experienced injection molding superintendent to administer the second shift in our large modern plant. Applicants must have proven supervision records. The individual selected will have a permanent position in suburban Chicago, a substantial salary, bonus and opportunities for further advancement. FEDERAL TOOL CORPORATION, 3600 Pratt Blvd. Chicago, Illinois.

SALES MANAGER for well known line of phenolic molding compounds. Experience in selling molding compounds and management of sales department. Excellent opportunity for an aggressive manager who knows this market. Write, giving age, education, experience, references and recent photo. Reply Box 303 Modern Plastics.

SALESMAN WANTED
Well established, large compression and injection molding concern desires services of experienced custom molding salesman. Substantial established accounts will be turned over to right man.
Reply Box 328 Modern Plastics

SALESMEN for fast growing midwest injection molder. Will consider man controlling one account or deal. Prefer man with experience in plastics and capable of giving some engineering service to customer. Applicant assured of excellent cooperation of plant equipped for volume molding, assembly, painting, etc. Men required in all industrial areas. Reply Box 305, Modern Plastics.

SALESMEN—Large manufacturer of plastic housewares desires full-time sales representatives for the New York and Chicago area. Excellent line and well-established line. Good salary, automobile, expenses and bonus. Send complete information concerning yourself. Reply Box 309, Modern Plastics.

STRUCTURAL LAMINATED PLASTIC DESIGNER, with experience in advanced stress analysis and honeycomb panel design, desirable, for prototype, research and development analysis in reinforced polyester laminates. Shop testing and evaluation of design. Excellent opportunity for good engineer as department head. Washington, D. C. location. Give complete information on qualifications. Reply Box 317, Modern Plastics.

TECHNICAL SALESMEN—Rapidly growing medium sized chemical company serving the plastics and related industries requires services of three ambitious young men 23 to 35, for sales department. Only those vitally interested in increasing personal income through productive effort and who are capable of carrying heavy responsibility dealing with large industrial accounts need apply. Starting salaries in line with capabilities and experience. Must be willing to travel—will be home weekends. Company furnished car. One to five years' sales experience desirable. Drive and ambition essential. Reply Box 324, Modern Plastics.

TECHNICAL SALESMEN WANTED—Position open with large Midwest color manufacturer to head up color sales to the plastics and rubber industries. Must have some experience in the use of color in the plastics and rubber fields. Excellent opportunity for advancement in a new department. Reply Box 346, Modern Plastics.

UREA MOLDING COMPOUNDS—We have a client who has an unusually attractive opportunity for a seasoned chemical engineer or equivalent with substantial practical production experience, who can set up and supervise a medium size plant to produce Urea Molding Compounds. Company is well financed.
If you think your experience and ability coincide with the requirements, please write in detail, and if an interview is arranged, transportation will be paid by our client. Your reply will be held in strictest confidence. Address "Plastics," c/o Walter J. Zimmerman Associates, 225 Lafayette St., New York 12, N.Y.

VACUUM PLATING TECHNICIAN
Capable of assuming complete control of small vacuum plating department in a rapidly expanding plastic injection molding plant. Located in South-Central Indiana. New housing available. Reply forwarding complete experience and personal data.
Reply Box 313 Modern Plastics

SALES AGENTS WANTED

PLASTICS MOLD REPRESENTATIVE wanted for excellent quality machined or hobbed molds, and other precision tools, European built, at favorable prices, and good delivery time. Tool experience and large-concern contacts essential. Write Box 306, Modern Plastics.

REPRESENTATIVES WANTED — Exclusive territories. Company manufactures complete line of materials for the plastic industry and for those who use plastics. Products include adhesives, mold release solutions, special coatings, and many other specialties. Materials also used by the glass, electronic, aircraft and several other fields including Army and Navy. Sales are increasing steadily. Considerable repeat business. Reply Box 313, Modern Plastics.

MANUFACTURER'S AGENT—in the Chicago area, by a company developing an extrusion department with top production staff, separate extruding facilities, new, air-conditioned building, and production policy geared to seeking challenging applications of high quality. We want a man of proved ability who will help us build a house for all—and will pay accordingly. (Our people know of this ad). Reply Box 343, Modern Plastics.

SITUATIONS WANTED

EXECUTIVE TYPE—Engineering degree. Plastics since 1936. 12 years experience in compression, transfer, injection molding. Mill and Banbury operation. Experienced in supervision, department head. Well versed in problems of management, production, product design, construction and maintenance of dies and equipment. Estimating, sales service, and material control. Presently employed. Available April. Salary commensurate with ability and opportunities for advancement. Reply Box 338, Modern Plastics.

GRADUATE CHEMIST-ENGINEER—research, product development, production experience in laminating, coating, converting and printing of paper, cellophane, foil, plastic films of all types. Well versed packaging materials and techniques. Successful in taking new products from laboratory to production. Working knowledge of adhesives, resins, rubbers and plastics. 12 years diversified experience. Reply Box 339, Modern Plastics.

I have been supervising production and embossing of polyethylene film for three years. Because of conditions over which I had no control I am now looking for a permanent position where I can put my experience to work. My experience includes development work, take-up, and auxiliary equipment design. I am a Chemical Engineer, ambitious, and willing to relocate. Reply Box 342, Modern Plastics.

PRODUCT DESIGNER—Recent graduate, 6 years training. BA degree in Industrial Design. Experience in plastic toy design with large manufacturer. Desires career in plastics field. Interested in all phases of the industry. Looking for responsible position with future. Presently working in New York but will relocate. Reply Box 321, Modern Plastics.

SALES ENGINEER, 29, with extensive industrial following in Midwest, desires connection with reputable plastic moulder or decorator as Sales Representative on commission basis. In addition to successful sales record, can offer detailed knowledge of most plastic parts now being bought by refrigeration manufacturers in this area. Will consider exclusive representation with the right firm. Reply Box 322, Modern Plastics.

VINYL COMPOUND SPECIALIST—Ten years experience in vinyl formulations and evaluations, plastisols, organisols, surface coatings and adhesives. Dry blend and conventional extrusion compounding, including electrical formulations. Extrusion experience. Desire position in development, plant management or technical service. I am 32 years old, married and have a B.S. in Chemistry. Reply Box 327, Modern Plastics.

MISCELLANEOUS

WE ARE INTERESTED in contacting molders, extruders and calenderers to finance their accounts receivable. Advantageous terms. Reply in strictest confidence. Reply Box 316, Modern Plastics.

WANTED—Healthy Industrial Situation Net Worth $100,000.-$500,000. We offer an opportunity for a conversion from fixed assets to cash for present owner who wishes to retire or sell a going business. We have capital and aggressive management available to continue and expand a sound and established organization. Reply Box 332, Modern Plastics.

PURCHASING OFFICE for Plastics Molds would like Cooperation with experienced mold engineers and designers, on fee, retainer, or profitsharing basis. Correspondence invited. Reply Box 335, Modern Plastics.

FOR SALE
Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 326, Modern Plastics

WANTED molded clear polystyrene or lucite containers preferably with covers to hold 16 to 30 ounces. Submit samples and quotations to: SAXON PLASTICS CORP., 44 W. Houston St., New York City, New York.

All classified advertisements payable in advance of publication
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For further information address Classified Advertising Department, Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

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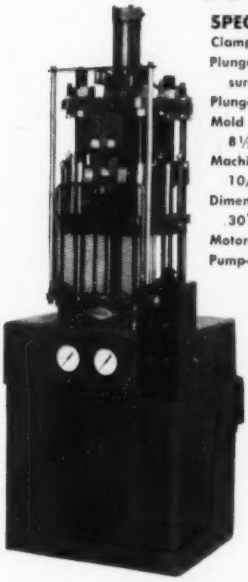

SPECIFICATIONS:

Clamping Pressure—50 Tons
Plunger or Transfer Cylinder Pressure—9½ Tons
Plunger Stroke—4 Inches
Mold Space between Tie Rods—8½"x8½"
Machine to Cycle (Dry Run)—10/Minute
Dimensions—Height 89" — Width 30"—Length 24"
Motor—5 HP
Pump—8 G.P.M.

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Motor—20 HP
Pump—50 G.P.M.
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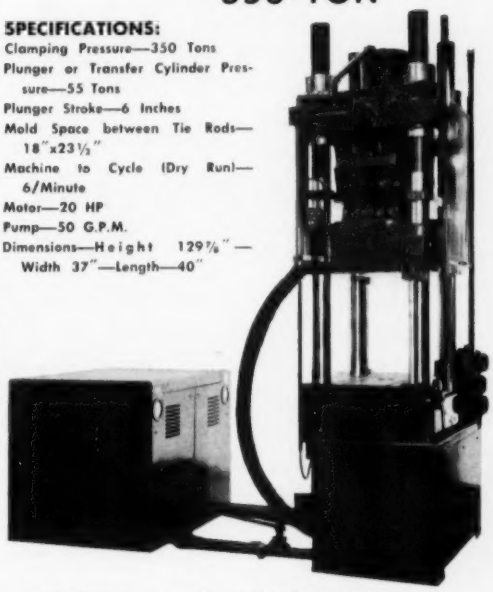

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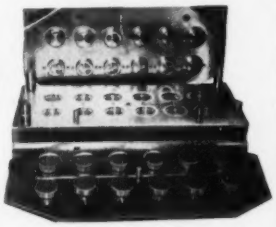
Quality *tested* **Production Molds**



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Mechanical Developers
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"Do you know of a manufacturer who . . . ?"

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MODERN PLASTICS

A Breskin Publication

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CBS Columbia

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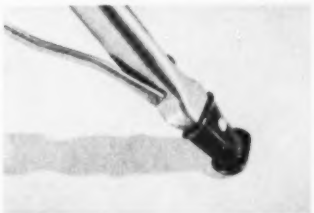

LONG-WEARING feet, made by J. R. Clark Co. from VINYLITE flexible compounds are for ironing table legs. Non-skid, take rough handling and use. Molded by Minneapolis Plastics Corp., 366 Wacouta St., St. Paul, Minn.

FLEXIBLE CASE for flashlight, molded in one piece from VINYLITE flexible compounds. Heat-sealed, disposable unit is waterproof, tough, inexpensive. By Hungerford Plastics Corp., Rockaway, N. J.

UTMOST PROTECTION for tube and pipe ends and threads during shipping, storage, handling, is given by these tough, low-cost caps and plugs molded from VINYLITE Plastic flexible compounds.

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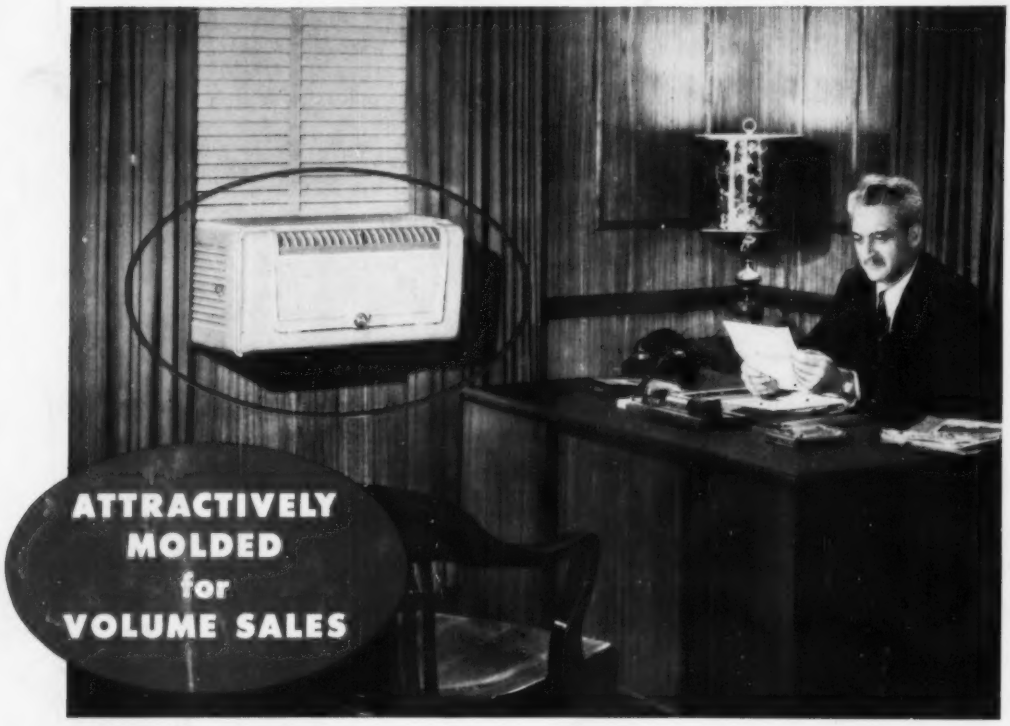

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